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[NOTE.—Articles from *Farming in South Africa* may be published provided acknowledgment of source is given.]

G.P.-S.9955—1946-7—7,600.

Information on Departmental Publications.

Farming in South Africa, the monthly journal of the Department, contains popular as as well as scientific articles on a variety of agricultural topics, useful to both the farmer and the housewife, while the **Crops and Markets Section** supplies information on crop prospects, market prices and exports of agricultural produce.

The following particulars in regard to subscriptions and advertisements should be noted :—

Subscription.—Within the Union, South West Africa, Bechuanaland Protectorate, Southern Rhodesia, Swaziland, Basutoland, Mocambique, Angola, Belgian Congo, and British Territories in Africa, 5s. (otherwise 7s. 6d.) per annum, post free, payable in advance.

Applications, with subscriptions, to be sent to the Government Printer, Bosman Street, Pretoria.

Advertisements.—The Tariff for Classified Advertisements is: 2d. (two pence) a word with a minimum of 5s. per advertisement (prepaid). Repeats, not entailing any change in the wording, will be published at half the cost of the original.

Conditions:

(1) The advertisement will be classified under specific headings, and only one black letter (initial letter) is permitted.

(2) Advertisements in which prices are mentioned must contain the name and address of the advertiser. A nom-de-plume or box number only is not sufficient, and unless this condition is strictly observed, advertisements will not be accepted.

(3) Advertisements will be classified strictly in accordance with the subject-matter of the announcement, determined by the first item mentioned and cannot be inserted under irrelevant headings.

(4) Displayed, classified advertisements will also be accepted. The charge, however, will be 10s. per inch, single column, per insertion, without reduction for repeats.

Copy for Advertisements to be in the hands of the Government Printer, Pretoria, not later than the 20th of the month preceding publication.

Send all advertisements direct to the Government Printer, or write to him for details as to tariff for advertisements.

Popular Bulletins.—Bulletins on various agricultural topics are published by the Department to meet public demand. A list of available bulletins giving particulars of cost, etc., is obtainable free of charge from the Editor, Department of Agriculture, Pretoria.

Scientific Publications.—From time to time the different Divisions of the Department issue science bulletins incorporating the results of research work conducted by them. Other scientific publications issued are: "The Onderstepoort Journal " Memoirs of the Botanical Survey of South Africa ", " Bothalia ", " Entomological Memoirs " and the " Annual Reports of the Low Temperature Research Institute ". Information in regard to these publications is obtainable from the Editor, Department of Agriculture, Pretoria.

Press Service.—The Press of South Africa is now supplied with a bulletin of agricultural information for their exclusive use. This information is supplied to all newspapers and other journals throughout the country.

Farmer's Radio Service.—In addition to the printed information supplied by the Department to members of the farming community, the Department, in collaboration with the South African Broadcasting Corporation, also has a national broadcasting service for farmers. Information in regard to times of broadcasting is contained in the programmes issued by the Broadcasting Corporation.

Inquiries.—All general inquiries in regard to the above should be addressed to the Editor, Department of Agriculture, Pretoria.

D. J. SEYMORE, Editor.

A New Year's Message:

By the Honourable J. G. N. Strauss, K.C., Minister of Agriculture and Forestry.

The year 1946 will remain memorable as marking the first steps by all nations on the road to readjustment of their own internal economies, aware of the dangers of inflation and the even greater disasters of depression, which have always followed past wars, yet hesitant to take the next step in case it may precipitate the very evils they attempt to avoid. We see the struggle between the desire for immediate gain and freedom from restraint and the fear of the consequences which such actions may bring.

This country stands on the threshold of a new era in its development. New vistas of opportunity are opening up before us leading to new levels of production, of employment, and of living standards. We are, however, still experiencing conditions of shortages and of rising prices. The realisation of our visions for the future will largely depend upon our ability to balance supply and to scale down prices in an orderly manner.

In these tasks agriculture must play a major part, not only by raising production to new heights, but above all by reducing costs through improved farming and through greater efficiency. Agriculture is the *permanent industry of any nation, and to achieve the greatest degree of permanency our farmers must be prepared to sacrifice excessive immediate gain in order to obtain stability for the future. Healthy prosperity for the present and the future, rather than excessive, short-lived immediate profits, must ever be our goal.*

The farmers of this country have shown themselves capable of rising to the heights demanded by grave circumstances, and my wish is that in the coming year even greater wisdom, courage and determination will be theirs in the accomplishment of the great tasks which lie ahead.

Minister of Agriculture and Forestry.

Winter Pruning and Trellising of Vines.

IN Bulletin No. 249, dealing with the pruning and trellising of vines, Prof. C. J. Theron gives a detailed description of the various parts of the vine as they appear at the end of the summer, which is the growing period of the vine. The treatment of all the parts at pruning time is described for different grape varieties and for different purposes. This bulletin includes a discussion of short and long pruning, training along posts, cordon and renewal. Different trellising systems of wine and table grapes—those recommended as well as those already in use—are also discussed. The advantages and disadvantages of the different systems and materials such as wire, posts and stays required for trellising, are given in detail.

The contents of the bulletin consist partly of well-known facts, but the bulletin also includes the results of years of experimenting by the writer in connection with the pruning and trellising of vines. Many wine-farmers think that they are quite familiar with the pruning of ordinary vines and that in so far as the yields are concerned, this industry does not call for any improvement, but proper pruning can prolong the productivity of the vine and in this respect much can be learnt from the bulletin.

This bulletin is obtainable from the Editor, Department of Agriculture, Pretoria, or from the Principal, Stellenbosch-Elsenburg College of Agriculture, at 3d. per copy, payable in advance.

FARMING IN SOUTH ... AFRICA

VOL. 22 | JANUARY 1947 | No. 250

A NEW YEAR'S MESSAGE:

Light on the Horizon.

Dr. C. H. Neveling, Secretary for Agriculture.

WE entered the year 1946 with fear and trepidation, for, after three successive years of early summer droughts, the future was dark. Thanks to the lateness of the first frost, and especially to those farmers who risked late plantings, we managed to pull through reasonably well even though we were compelled to import large quantities of grain (obtained with difficulty from meagre world supplies) and to take drastic steps to limit the consumption of cereals.

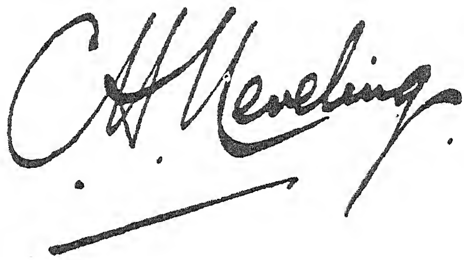
For 1947 I am very hopeful and optimistic. The wheat crop promises to be a bumper crop; maize was planted in good time on the highveld and grazing conditions compare very favourably with those of last year. Thus, there is every indication that our summer rainfall region—the country's principal production area—will once again experience a normal year and that those serious shortages which were such a marked feature of 1946 will not be suffered again.

Although the year augurs well, our agriculture will not be free from difficulties; the fertilizer shortage will persist and the position will probably not be eased much until after the completion of the new factory at the end of 1947; the

labour position will remain difficult, especially since the Italian prisoners of war will all be withdrawn for repatriation; agricultural equipment will not be readily available; protein-rich feeds will still be scarce and expensive and the serious shortage of bags will have a hampering effect. This is indeed a long list, but our farmers are accustomed to difficulties and, as the war years have proved, these difficulties will not deter them from straining every nerve.

I hope that the new year will be blessed with ample rains and that farmers will be richly rewarded for their efforts.

I wish you all prosperity!



Turkeys.

SOUTH AFRICA with its wide open spaces offers favourable possibilities for the breeding of turkeys. Unfortunately many persons are under the impression that poults cannot be reared as easily as chicks. With the information supplied by E. F. Lombard, Professional Officer (Poultry), East London, and A. [illegible]. Gericke, Professor of Poultry Husbandry, Agricultural Research Institute, University of Pretoria, in the new bulletin on "Turkeys", it is hoped that farmers will achieve greater success in future with the rearing of poults.

The nutritional requirements of poults are not the same as that of chicks. Poults require 3 to 5 per cent. more protein and 3 times more vitamin A than chicks in their ration. A deficiency of these essential elements in a ration has contributed much in the past to the high mortality in poults from 3 days to 3 weeks of age. For the successful rearing of poults it is important for the producer to practise sound management and this can only be done by acquiring knowledge of breeding, feeding and the habits of turkeys.

The following aspects of turkey farming are discussed in the bulletin: (1) the economic value and history of the turkey; (2) breeds of turkeys; (3) the housing of turkeys; (4) breeding; (5) how to make a start; (6) management; (7) feeding; (8) incubation; (9) rearing of poults; (10) fattening; (11) marketing; (12) the health of the turkey; and (13) breed standards.

This new bulletin, No. 264, is obtainable from the Editor, Department of Agriculture, Pretoria, or from your nearest College of Agriculture, at 3 pence per copy, prepaid.

Three Useful Leguminous Fodder Trees.

E. E. M. Loock, Department of Forestry.

IN a country like South Africa where large areas are frequently stricken by drought and feeding presents a considerable problem, farmers should undertake more extensive plantings of one or more of the undermentioned important tree species, for their pods, which are of very high nutritive value. In the dry areas where the cultivation of annual fodder plants is a very precarious project unless it can be done under irrigation, the trees should receive special attention.

Mesquite or Prosopis Tree.

The mesquite (*Prosopis juliflora*) of the United States and Mexico, and *Prosopis chilensis* of Chile and the Argentine are probably among the most important fodder trees imported into South

FIG. 1.—Mesquite or Prosopis Tree.

Africa. As far as is known, the former was imported by the botanist Karel Dinter during 1897 and the first tree was planted in the experimental garden at Okahandja. Subsequently, it was planted in many other parts and to-day it is found practically throughout the country. In some parts of South-west Africa and in the districts of Carnarvon and Britstown the tree has already become naturalized and is spreading under natural conditions, the chief agent being animals which eat the pods and scatter the undigested seeds.

The screw-bean (*Prosopis pubescens*) was imported as early as 1885, but its pods are very small and of minor importance; it is therefore not described here. Even the pods of the sub-species of *Prosopis juliflora* are usually very small or less fleshy than those of the main species and for this reason they are not recommended either.

In certain parts of the world the mesquite sometimes attains a height of over 50 feet, but in this country where it is generally planted on poor and infertile soil, it seldom grows beyond thirty feet. Initial growth is very slow because the plant first develops a root system out of all proportion to the aerial part. The tap-root of a month-old tree has already been found to be over four feet in length. Once the plant has become established, it grows fairly rapidly under favourable conditions and can put on as much as six feet of growth annually but the average is from 1 to 3 feet per year.

Nutritional Value.—Of the three tree species discussed here, the mesquite is the most important and is cultivated mainly for the pods which have a high nutritional value, although the leaves, flowers, gum and even the wood are also of value to the farmer.

The value of the ripe pods is well known in all countries, and even in the areas of the Union where the tree is grown. The nutritious part consists of proteins, gum, dextrose, fats, etc. (see table of analysis below). Owing to their high sugar content, the pods are relished by horses, cattle, donkeys, sheep, pigs, etc. The crushed pods may be fed to the animals with or without bran or some other feed.

Ripe pods have the same nutritive value as maize, but green pods are bitter and of no value as a food. When the pods are ripe, they drop off and should be gathered immediately and stored in a dry spot till required. If pods exposed to rain are fed to animals, the presence of germinating seeds in the stomach may cause illness. Cases of mortality from this cause have occurred oversea.

The seed is very hard and passes undamaged through the alimentary tract of animals, but is nutritious when ground. The Indians in America even make bread from this meal.

The leaves, which are shed in winter in very cold parts, and the young shoots, are also nutritious and can keep animals alive in times of scarcity. The stumps of felled trees make new growth.

The blossoms, which are borne in profusion during September are rich in nectar and are, therefore, very important to the apiarist. In other countries the gum which is secreted by the branches and trunk, is used in the manufacture of confectionery.

The wood is heavy, hard, fine-grained, extremely durable and makes very good posts when planted in the soil. It is also excellent fuel.

Climatic and Soil Requirements.—Prosopis does better in warm, dry, protected areas, which more or less correspond to the thornveld of the Karroo and the Transvaal. It is fairly resistant to frost and cold once it has become established, but does not stand up very well to the severe frost of the Highveld. If planted in soil with a northern aspect which is slightly protected against the cold winds, this tree can be established in comparatively cold parts, especially if the young plants receive some protection against frost during winter.

The tree grows on almost any type of soil, which can be penetrated by the long tap-root. For the best development, however, it requires a deep, sandy soil, like that found along rivers, but it also grows well on clay, lime and brak soils. Because the plant has such a long tap-root (sometimes as long as sixty feet) it can withstand any drought.

Propagation.—Mesquite can easily be propagated from seed. The pods do not shatter; they must be broken to remove the seed. Germination of the seed is accelerated by soaking the seeds in very hot water and for about 24 hours allowing the water to cool. One lb. of seed should yield from 2,000 to 3,000 plants.

Because the young plant develops a long tap-root so early in its life, it is better to sow the seed directly in well-prepared soil immediately after the first good rains. The plants can also be grown in tins in a nursery for planting out later in the rainy season. Game and other animals are fond of the young trees, which must, therefore, be protected till their crowns are out of reach.

Since the tree is planted mainly for its pods, the plants should be spaced 20 feet apart in order to give each tree sufficient space for the maximum development of its crown. The larger the crown, the larger the crop that can be expected. Under very favourable conditions the tree will start bearing from its fourth or fifth year and from its tenth year it can be expected to yield 200 lb. of pods.

"Honey Locust" or Gleditsia Tree. (Gleditsia triacanthos.)

As the name of this tree implies, the pods, which grow to a length of as much as 18 inches, also contain sugar, which greatly enchances the value of the pods as fodder.

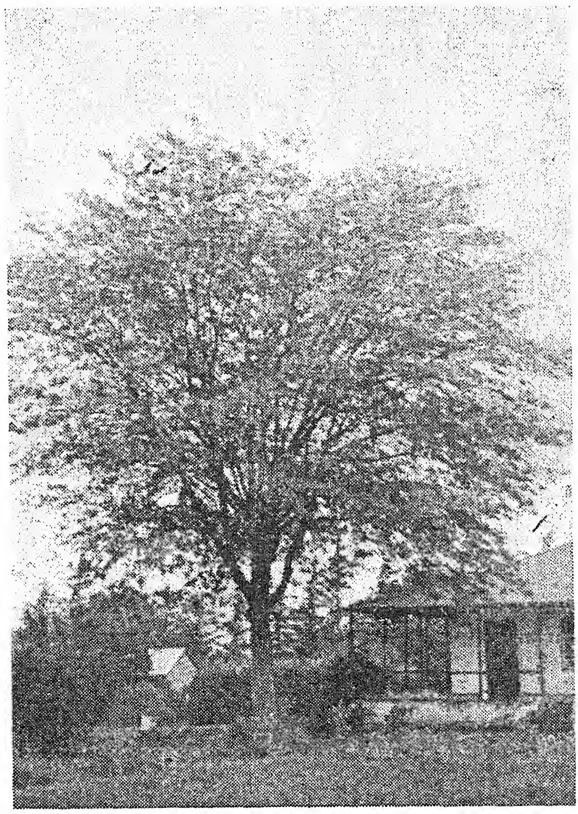


FIG. 2.—The Honey Locust or Gleditsia Tree.

Gleditsia is a fairly large deciduous tree with or without thorns, according to the variety. Its country of origin is America, but the tree is now found in many parts of the Union as an ornamental, shade or fodder tree. Owing to its adaptability and resistance to frost and drought it can be successfully grown practically everywhere.

Since the tree is inclined to put out suckers, it can also be planted in dongas for the control of soil erosion.

Nutritional Value.—Since this species yields pods with a high percentage of sugar and other beneficial nutrients, it should be planted chiefly as a fodder tree. It is also very attractive as an ornamental tree on a farm and will provide the necessery shade for stock during the hot summer months. The pod yield differs from one tree to another and it is, therefore, desirable to produce high-producing trees by budding or grafting.

The wood is heavy, strong and fairly durable in the soil and can be used as fuel and poles on the barren flats of certain parts of the country. The small, greenish-white flowers, borne in small racemes are rich in nectar and will increase the honey yield considerably. Even the leaves which drop during autumn when other green stuff is so scarce, is eagerly eaten by animals.

Climatic and Soil Requirements.—Gleditsia is one of the hardiest fodder trees known. It is resistant to frost, cold and fairly severe droughts and can be planted in almost any part.

It grows in all types of soil, but does best in deep, sandy, loam soils, like those found along rivers.

Propagation.—Gleditsia can easily be grown from seed. The pods are brittle and the seeds can readily be removed from the fleshy part. Before the seed is sown, however, it should be soaked in boiling water, as in the case of Prosopis, and then planted in a nursery or in a permanent site.

The tree grows fairly fast and under favourable conditions will bear from the fourth or fifth year. At Middelburg, C.P., there is a tree which yielded an average of 500 lb. of dried pods between the ages of 7 and 12 years. The spacing is the same as for Prosopis.

Carob or Locust Bean. (Ceratonia siligua.)

Carob comes from Syria and the northern coasts of America, but has now become naturalized in all the hotter parts of the world. There are frequent references to this tree in the Bible, since it was well known in both Syria and Judea. It is claimed that the honey and locusts on which John the Baptist lived in the desert, actually were the pods of this tree, but the literal interpretation of the terms is probably more acceptable. The Prodigal Son is also alleged, in his wanderings, to have lived on these pods, which in those days were fed to the pigs.

The geographical spread of this tree was initiated by the ancient Greeks who introduced it into Italy and by the Arabs who brought it to Spain and Morocco. To-day it is found in all the hotter countries of the world.

As far as is known, the first seed was imported into the Union from England during the year 1870 and distributed amongst farmers, with the request that they be sown in the desired permanent sites because it is a difficult tree to transplant. Trees from this seed were successfully grown in the district of Albany (now Grahamstown).

Later, when the importance of this species of tree was recognised in other countries, more seed was imported and to-day the tree is found in many parts of the country.

FIG. 3.—The Carob or Locust Bean Tree.

It is a medium-sized evergreen and is ornamental. It is famous for its pods which are produced in large quantities and highly valued for their nutritional properties. The species is trioecious, i.e. certain trees bear only staminate flowers, others only pistillate flowers, while other bear hermaphrodite flowers. For this reason trees should be planted in groups of ten or more, otherwise pollination may not take place.

Nutritional Value.—The carob is grown mainly for its pods which have been used as stock feed oversea for hundreds of years. In certain regions it is also used to a small extent as food for the poor in times of scarcity.

Because the ripe pods contain a high percentage of sugar and other digestible materials, it is regarded as a very valuable feed for pigs, sheep, cattle, horses, etc. The pods can be fed as such to pigs

but for other animals they must be mixed with hay, grass or oats, after having been crushed with a hammermill.

In other countries the pods are also used for the distilling of alcohol. A hundred pounds of properly treated pods yield about 4 to 5 gallons of alcohol.

Climatic and Soil Requirements.—The tree grows best in a warm climate, but with some protection against frost and cold during the first few winters, it can even be planted in fairly cold areas. It thrives excellently in the coastal areas, but also grows well in parts of the Transvaal where the winters are not too severe. It is, however, not proof against the severe frost of, for instance, the Transvaal highveld. The tree can be planted on any type of soil, provided it is not too wet, but for the best development a deep, porous and well-drained sweet soil is most suitable. Owing to the early development of a very long tap-root it has a high resistance to drought.

Propagation.—Trees are usually grown from seed. Since the seed coat is very hard, the seed should also first be soaked in boiling water as described under prosopis.

The young plants do not transplant well, because the long tap-root is usually damaged in the process. It is, therefore, recommended that the seed should preferably be sown in situ, or otherwise single seeds can be sown in one-gallon (or larger) tins, and when the plants are about 9 to 12 inches high the tin can be cut open at the bottom and the seedlings planted soil and all in well prepared holes 20 to 25 feet apart.

The hermaphrodite and male trees bear few or no pods and for this reason most plants are grafted with scions taken from heavy-bearing female trees. All the trees should not be grafted, however, otherwise they will all bear female flowers only and there will be no male flowers for cross-pollination, with the result that the trees will bear no pods.

In South Africa grafting has not yet been practised on a large scale. The only known grafted trees are two at Kirstenbosch and a few on a farm at Addo. The trees at Kirstenbosch were grafted in 1921 with scions of a good strain growing in Pretoria, but according to the latest report (1938) they had not yet produced larger yields than those raised from seed. It should be added that the seed offered for sale, is gathered only from trees which bear well.

Under favourable conditions, seedlings should begin to bear from their 6th to 8th year, and grafted trees from the third to fourth year.

Analysis of the Ripe Pods.

Below is an analysis of the ripe pods made by the Chemical Division of the Grootfontein College of Agriculture.

For purposes of comparison the analysis of maize and lucerne are also included.

Analysis of the Pods and of Maize and Lucerne.

Species.	Protein Per cent.	Carbohydrates. (Sugar and Starch.) Per cent.	Fat Per cent.	Fibre Per cent.
Prosopis	14·7	59·7	3·0	18·3
Gleditsia	23·1	54·2	4·6	12·7
Carob	7·4	75·5	2·8	10·8
Maize	9·8	73·1	4·7	1·7
Lucerne Hay	15·5	30·6	2·1	34·8

Veld Management in the Marginal Grassveld Areas.

Dr. C. E. Tidmarsh, Pasture Research Officer, Grootfontein College of Agriculture, Middelburg, Cape.

THERE appears to be a rapidly growing interest in the conservation and management of veld among the farming communities of the Marginal Grassveld areas. It is therefore important that a brief outline of some of the more promising results of recent researches in this region should be submitted as a guide to the incorporation of grazing systems in practical farm management. Since, however, many farmers in the region are probably not familiar with the term "marginal grassveld" and what it implies, it will be as well to define the area, and describe some of its more pressing problems at the outset.

Outline of Region.

The region, which has a mean annual rainfall ranging from about 18 to 25 inches, comprises a relatively large tract of country (approximately 10,000 square miles), bounding the Mixed Karoo areas on the north-east, east and south-east, and includes the districts of Brandfort, Bloemfontein, Thaba 'Nchu, Dewetsdorp, Reddersburg, the western portion of Wepener, the eastern portions of Edenburg, Smithfield, and Rouxville, the district of Aliwal North, the lowlands of Lady Grey, the districts of Burghersdorp, Molteno, Jamestown, the eastern portion of Tarkastad, and western portion of Queenstown.

Menaced by Advance of Mixed Karoo.

This tract of sweet grassveld is at present in a critical conditon. It is seriously menaced, along its western border, by the rapid advance of the Mixed Karoo, to which it has already yielded vast areas during the past century

Although, from the point of view of sheep farming, the conversion to mixed veld is indeed welcomed by many, it is in truth an extremely dangerous process. The inroads of the Mixed Karoo, with its sparse, open vegetation, are wreaking havoc on the soils of the grassveld areas so invaded, with the result that these areas have, in general, become the worst eroded in the country. It is both urgent and vital, therefore, that further advance of the Mixed Karoo be halted, and it is this that gives to the Marginal Grassveld region its strategic importance, and places on the farmers of this region a burden of responsibility towards the grasslands to the east, since it is here, in the sweetveld areas, that the bulwark against the destructive invasion of the Karoo must be built. This can best be achieved by consolidation of the grass cover by means of careful and judicious veld management.

Grazing Systems.

To this end, researches were begun in 1941, on the farm Elandshoek, owned by Mr. L. S. Dorrington, in the district of Aliwal North, and these have yielded some valuable results.

1st System.—The following 3-camp system of grazing rotation, in which cattle alone were employed, has proved eminently successful.

The 3-Camp System of Grazing Rotation.

Year	Camps.		
	1	2	3
1st..........	Spring and early summer. 2nd half of winter.	Late summer.	1st half of winter.
2nd.........	1st half of winter.	Spring and early summer. 2nd half of winter.	Late summer.
3rd..........	Late summer	1st half of winter.	Spring and early summer. 2nd half of winter.

This system has produced a remarkable improvement in the composition and cover of the veld, and has maintained the cattle in good condition throughout each year, and also during the past severe drought, during which period no supplementary fodder was fed. An important feature has been the great increase in the more desirable and palatable grasses at the expense of the less nutritious species, and the high carrying capacity of 1 head of cattle per 3½ morgen attained.

2nd System.—Although there is no doubt that the problem of veld restoration is much simplified by the elimination of sheep, and by the use of cattle alone in a system of grazing rotation, our researches in the Marginal Sweetveld indicate that the veld can also be satisfactorily conserved when both cattle and sheep are employed in suitable grazing rotation, as in the 5-camp system set out below.

It will be noted that the sheep always follow the cattle in this system. The cattle, given first choice of the veld in any one camp, graze it down fairly uniformly, and leave for the sheep an even stand of short, nutritious veld.

Both cattle and sheep have been maintained in satisfactory condition in this system, which has supported approximately 1 head of cattle and 4 sheep per 4 morgen of veld. By the inclusion of sheep with cattle, it will be noted that a great increase in the carrying capacity of the veld has been achieved, as compared with the 3-camp system outlined earlier for cattle alone.

Although, from the point of view of the veld also, the 5-camp system, with this heavy rate of stocking, shows distinct promise of success, it would, however, be safer, in general farm practice to adopt a lighter level of stocking during the first few years at least.

The 5-Camp System of Grazing Rotation.

Year.	Camps.				
	1	2	3	4	5
1st..................	Spring (sheep). 1st half winter (cattle). 2nd half winter (sheep).	Spring (cattle). Early summer (sheep). 2nd half winter (cattle).	Early summer (cattle). Late summer (sheep).	Late summer (cattle). Autumn (sheep)	Autumn (cattle). 1st half winter (sheep).
2nd.................	Autumn (cattle). 1st half winter (sheep).	Spring (sheep). 1st half winter (cattle). 2nd half winter (sheep).	Spring (cattle). Early summer (sheep). 2nd half winter (cattle).	Early summer (cattle). Late summer (sheep).	Late summer (cattle). Autumn (sheep).
3rd..................	Late summer (cattle). Autumn (sheep).	Autumn (cattle). 1st half winter (sheep).	Spring (sheep). 1st half winter (cattle). 2nd half winter (sheep).	Spring (cattle). Early summer (sheep). 2nd half winter (cattle).	Early summer (cattle). Late summer (sheep).
4th..................	Early summer (cattle). Late summer (sheep).	Late summer (cattle). Autumn (sheep).	Autumn (cattle). 1st half winter (sheep).	Spring (sheep) 1st half winter (cattle). 2nd half winter (sheep).	Spring (cattle). Early summer (sheep). 2nd half winter (cattle).
5th..................	Spring (cattle). Early summer (sheep). 2nd half winter (cattle).	Early summer (cattle). Late summer (sheep).	Late summer (cattle). Autumn (sheep).	Autumn (cattle). 1st half winter (sheep).	Spring (sheep). 1st half winter (cattle). 2nd half winter (sheep).

3rd System.—A third system of grazing rotation, which is proving satisfactory elsewhere, and which might well be adopted in in Marginal Grassveld, is the following 4-camp system, with both cattle and sheep.

The 4-Camp System of Grazing Rotation.

Year.	Camps.			
	1	2	3	4
1st............	Spring (sheep). Early summer (sheep). 2nd half winter (cattle).	Spring (cattle). Early summer (cattle). Late summer (sheep).	Late summer (cattle). 1st half winter (sheep).	1st half winter (cattle). 2nd half winter (sheep).
2nd...........	1st half winter (cattle). 2nd half winter (sheep).	Spring (sheep). Early summer (sheep). 2nd half winter (cattle).	Spring (cattle). Early summer (cattle). Late summer (sheep).	Late summer (cattle). 1st half winter (sheep).
3rd............	Late summer (cattle). 1st half winter (sheep).	1st half winter (cattle). 2nd half winter (sheep).	Spring (sheep). Early summer (sheep). 2nd half winter (cattle).	Spring (cattle). Early summer (cattle). Late summer (sheep).
4th............	Spring (cattle). Early summer (cattle). Late summer (sheep).	Late summer (cattle). 1st half winter (sheep).	1st half winter (cattle). 2nd half winter (sheep).	Spring (sheep). Early summer (sheep). 2nd half winter (cattle).

This system is but a simple extension of the 3-camp system for cattle alone. The same seasonal grouping is employed, and one additional camp provided for the inclusion of sheep in the rotation. From the point of economy, this system has the advantage of the 5-camp system in necessitating one camp less, and where water provision presents even greater difficulties than fencing, this is a most important, practical consideration.

Grazing Periods not Rigidly Defined.

An important feature of all the systems of grazing rotation outlined, is that the grazing periods are not rigidly defined according to the calendar, but according to the natural and variable seasons themselves. Further, the practice of the systems is made as elastic as possible, in conformance with the erratic climate. Thus, during periods of drought, when the veld is dormant, departure is made from the schedule, and the animals allowed to graze wherever grazing is to be had. On the advent of rain, however, return is made to the system, and the animals are again confined to the camps scheduled for that particular season.

In conclusion, it must be made clear that any of the systems outlined in this article can accommodate only a single herd of cattle, or otherwise one herd of cattle and one flock of sheep. Thus, for example, if three separate herds of cattle, and three separate flocks of sheep are to be maintained (as in common farm practice),a minimum of 12 camps is required in the case of the 4-camp system.

Anti-Erosion Measures for the Swartland.

Dr. J. T. R. Sim, Professor of Agronomy, Stellenbosch-Elsenburg College of Agriculture.

IN 1919 the Departmental Committee appointed to enquire into the wheat industry expressed the view that wheat production had reached its peak in the Swartland—that major wheat-growing area around Malmesbury. Since that time, however, wheat production

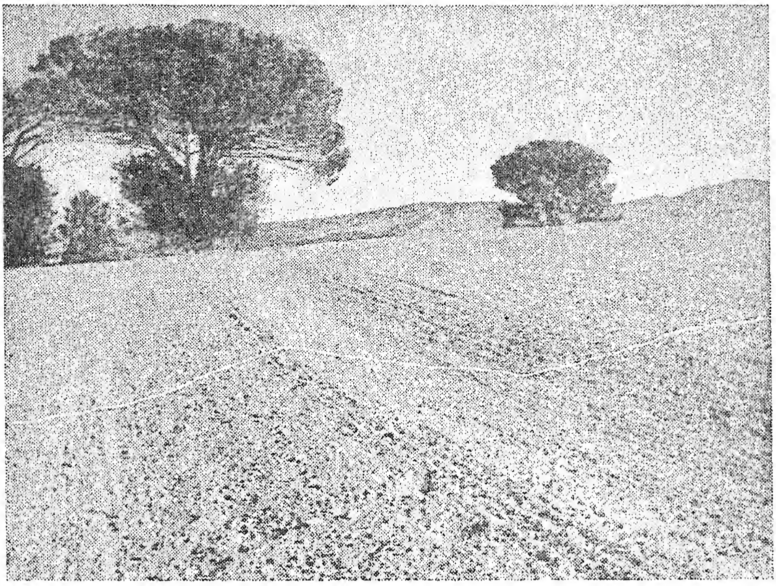


FIG. 1.—A broad base terrace.
[*Photo: Reg. M. Nicholson.*

has continued to expand there, but it has done so at the expense of the soil. This expansion of wheat production was brought about in two ways, each of which provides a background for remedial measures and for future farming policy.

The first way in which it was effected was by the cultivation of soil which in 1919 was regarded as unsuitable for economic wheat production—soil too poor in fertility, too shallow or too steep for cultivation.

The second way was the intensification of the farming system. In earlier days the system of farming allowed for the production of a crop of wheat on a particular land, then a crop of oats, then a rest period of several years as old land (uncultivated fallow) during which many plants developed good root systems and so replenished organic matter reserves in the soil, and at the same time provided a useful surface plant cover to curb the movement of run-off water. Finally the old-land period was followed by a year of cultivated fallow in preparation for the next wheat crop.

As time went on, the old-land period became shorter and shorter, until by 1919 the general system had reached the stage of a 4-course

rotation of wheat—oats—old land—fallow. But from then onwards, and especially after the wheat price stabilization measures of 1930, the rotation was still further shortened, first to wheat—oats—fallow, or wheat—old land—fallow, and finally to wheat—fallow, with half the cultivated land under wheat and half under fallow. A more disastrous system could hardly be devised.

The system is bad, for with the intensification of grain production and the consequent niggardly treatment meted out to livestock, Nature's balance between plant, animal and soil has been upset, and the system has become nothing less than one of agricultural mining. In this system the grain crops, which in the main are sold and consumed elsewhere, take all they can out of the soil, and each year leave the soil so much poorer than before. Under such exploitation the soil has now broken down, not only in fertility but also in its structure and in its resistance to erosion.

Bitter experiences of poor crops and lands torn by erosion during the last few seasons of heavy winter rainfall have revealed the disastrous nature of the system to the majority of Swartland farmers, and they are now seeking ways and means whereby they may successfully combat the menace of soil erosion and restore the fertility of their lands.

The answer to their problem, of course, is proper land treatment. But there again, what exactly constitutes proper land treatment in the Swartland region, where for decades the farmers have had grain as their main line of production, with livestock (primarily sheep) as a side line, utilizing for grazing the volunteer plants on the old lands, fallow lands and the fallen ears and straw on the stubble lands? There is no veld to speak of, for practically the entire area is under the plough.

Revolutionary Changes Necessary.

Some revolutionary changes in the system have now to be made, and according to our present knowledge these consist primarily of (1) the relinquishment of the old established idea of farming square fields, and (2) the introduction of measures which will keep the soil fertile, in good heart and resistant to erosion. Excess run-off water has to be controlled and the soil must be stabilized. In addition, livestock must play a more important rôle than heretofore in the farming system.

Broadly, mechanical works and methods of cultivation must be introduced, in the form of contour banks and cultivation on the contour, to control the movement of excess water which cannot be absorbed into the soil; and humus-producing crops (which also provide additional stock feed) must be grown in rotation with the humus-destroying grain crops, so as to induce a good soil structure which is so essential for withstanding the eroding effects of water, and to improve the soil's fertility and productive power.

Contour Banks.

In general, the Swartland is an undulating area with hills and dales. Therefore, provision must first of all be made to prevent any rain water, which is not absorbed into the soil, from racing downhill and carrying soil with it as it goes. This run-off water must never be allowed the chance of gaining velocity, for it is the speed of this moving water which does the damage.

This can best be achieved by building mechanical works, which form barriers to the down hill movement of water, in the form of contour banks or terraces across the slope of the land. Experiments are in progress to determine the best type of contour bank and the

most suitable distance between banks on varying slopes. The experience gained up to date indicates that the *broad based terrace* (over which cultivation may take place) is the most suitable for lands with a slight slope, say up to 10 to 12 per cent. slope. As the slope becomes steeper, more erect banks—*ridge terraces* (which cannot be cultivated)—are necessary. All cultivation then takes

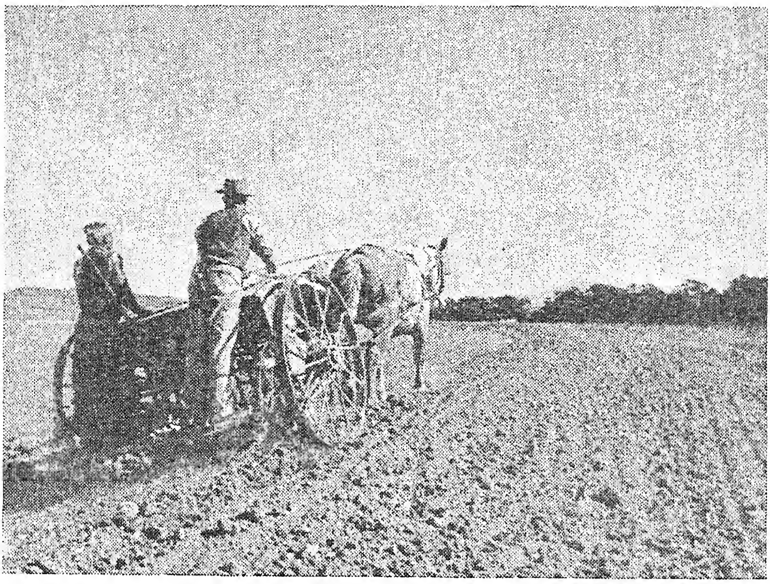


FIG. 2.—Sowing the broad base terrace.
[*Photo: Reg. M. Nicholson.*

place between the banks. The distance between banks will depend mainly on the slope of the land. On a 10 per cent. slope they may be about 75 to 90 feet apart, whereas on a steeper slope they must be closer together to prevent the washing which causes erosion.

The point may be made here that these so-called contour banks are not truly on the contour or exactly horizontal. Instead they are slightly off the contour, being given a fall of anything from 1 in 800 at the start to 1 in 300 at the outlet. The excess water moving off the strips of land between the banks accumulates against the lower bank, and then moves quietly down the incline to empty into discharge channels which remove the water from the field without any erosion being caused.

Discharge Channels or Runways.

The discharge channels may be made vertical to the slope and as straight as possible, or they may be natural depressions which for years have removed the run-off water from the land. These channels require careful treatment, otherwise they may quickly be gouged into great dongas by the water emptied into them.

American experience has indicated that it is advisable first to stabilize the channels before subjecting them to the force of the water emptying into them from the contour banks. In most cases this is done bv establishing a thick mat of grass in them. It is here that the Swartland farmers finds a big snag, for the hot dry conditions of summer are so severe that practically all of the best grasses for this purpose fail. The hardiest of the grasses in the

Swartland is kweek (*Cynodon dactylon*), and farmers should make full use of this grass, planting it along the sides and in the bed of the channel itself. Kikuyu grass may also be tried for this purpose, but it is doubtful if it will succeed in the drier parts.

Careful attention should also be given to the shape of the discharge channel. All too frequently such channels are made in the form of narrow ditches. Such ditches can easily develop into dongas, and the dongas can become larger as their sides cave in. The best type of channel bed is one which is wide and shallow, and of course, if possible, it should be well grassed. The whole object must be to spread the discharged water over the whole bed of the channel, for the eroding effect of the water is then reduced to a minimum.

Where grass cannot be grown satisfactorily in the discharge channels, the next best method is to seek stony ground, which will not easily erode, on which to make the channel. If suitable stony ground is not to be found, the only remaining plan is to make barriers of treated wood or concrete in the channel to curb the speed of the water. Here the advice of a soil erosion engineer should be sought.

Contour Cultivation.

The provision of contour banks on a land naturally requires the various cultural operations to be conducted on the contour. In the case of erect banks, all operations must be kept strictly to the strips between banks. The banks themselves may be stabilized by getting plants such as kweek established on them. In the case of broad based terraces the banks themselves may be cultivated. The banks are first ploughed, fertilized and sown, and then the strips between them. Harvesting may take place over them if needed.

With either kind of bank, however, care must be taken to maintain the banks at the appropriate height. This is particularly important at those places where wagons, tractors and implements must cross them in order to reach the different strips. At these places the banks tend to become flattened out in consequence of the tramping of draught horses, the weight of the tractor, and the loosening of the soil by the various implements, and such places constitute danger spots in the system if left unrepaired. Therefore, as soon as an operation is completed, or if there is a threat of heavy rain these weak spots must be repaired, so as to be able to carry the water away without danger of a break-through.

Soil Structure.

While the erection of appropriate contour banks and subsequent cultivation on the contour form the first step in the conservation programme, it must be clearly understood that they form only one part of that programme. It must always be borne in mind that the soil erodes because wrong practices have led to the breakdown of its structure, leaving it an easy prey to the forces which cause erosion. The main thing in erosion control, therefore, is to apply such practice as will restore a good soil structure, and thus render the soil resistant to those forces.

The desired soil structure is what is called the crumb structure i.e. an aggregation of individual soil particles into crumbs. The crumb structure is induced by the decay of organic matter in the soil. During decay, organic colloids—sticky substances—are produced and bind the particles into crumbs. In order to induce this crumb structure and to maintain it, the soil must be regularly supplied with organic matter in one form or another. Under

cultivation the organic matter of the soil is constantly being destroyed by decay and if the organic colloids, which are largely responsible for the crumb structure, are to be constantly produced, then organic matter has to be added regular to cultivated soils.

Organic Matter.

Organic matter may be introduced into the soil in various ways. The stubble and roots of the grain crops provide some organic matter, but the quantity is totally inadequate for the purpose. The long straw of grain crops which have been stripped or combined adds more, but still too little, organic matter. Green manuring in the Swartland has been found to be neither practical nor economic. Manure is an excellent source of organic matter, but there is far

FIG. 3.—Rotation experiments with lucerne. Wheat in the right foreground is after lucerne; in left foreground wheat after fallow.

too little of it. The remaining material is the chaff left over after threshing. It has been found that chaff added to manure in the kraals and stables provides an excellent strawy manure, and that this material, or even pure chaff when added to the soil, causes a marked improvement in the soil's water-absorbing and water-retaining powers—the land remaining workable for a longer time—and also in the subsequent grain yield. Unfortunately, however, even the use of all these forms of organic matter is quite insufficient for treating the extensive grain lands adequately, and some other method of supplying the needed organic matter has to be sought.

Nevertheless, every bit of organic matter on the Swartland farm must be conserved, and in some or other form returned to the soil. As much as possible should be passed through the kraals and stables, and the chaff that is over should be applied directly to the lands at the rate of 3 tons per morgen. Unfortunately there are still a few ignorant farmers who sell manure and chaff from their farms, and the sooner such a practice is proclaimed a punishable offence, the better.

Rotation and Humus-producing Crops.

The only remaining means of providing organic matter to restore the soil's structure and fertility is the growing of some or other plant which can build up an adequate supply of organic matter in the soil. Such plants are commonly known as humus-producing plants, and wherever in the world good farming is practised we find that humus-producing crops are being grown in rotation with humus-destroying or humus-consuming crops such as grain.

This is the type of system which has got to be introduced on to every farm in the Swartland. *There is no other solution to the problem.*

It is generally agreed that the grasses, with their mass of fine roots in the top-soil, are the best humus-producing crops. But, as mentioned earlier, the very severe summer conditions which prevail in the Swartland, preclude the successful growing of grass in that area. Kweek alone survives the summer, but it never forms a sward, as do grasses in milder areas.

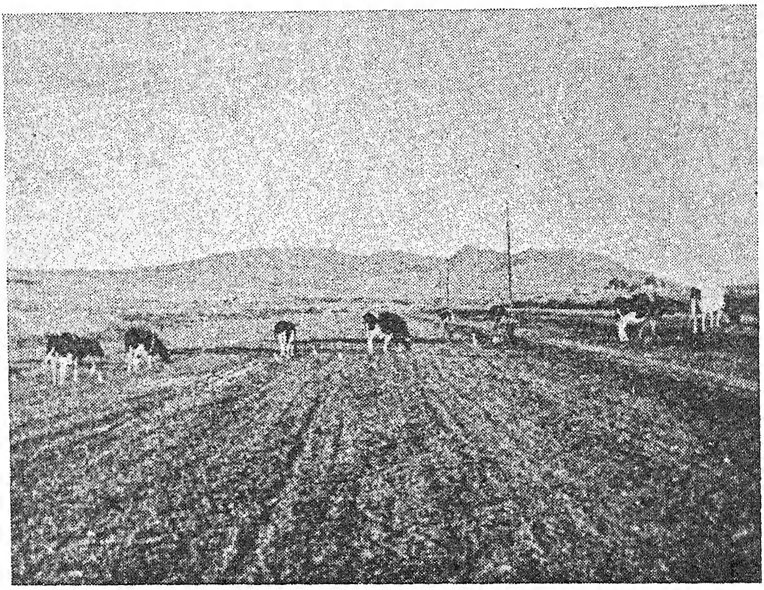


FIG. 4.—Dairy cows on lucerne pasture in the Swartland.
[*Photo: Reg. M. Nicholson.*

Since, therefore, suitable grasses are not at present at the disposal of the Swartland farmer, other humus-producing plants must be considered. Hundreds of such plants have been tested out at the Elsenburg and Langgewens experiment stations, and of them all, lucerne alone, when grown as a dryland crop, has given satisfactory results. During the severe summers it does not make active growth, but it remains alive, and then from the autumn to the following early summer supplied valuable grazing and builds up a large root system. Lucerne, therefore, is the crop which must now be used as the means of restoring fertility and erosion resistance to Swartland soils.

It must not be assumed that lucerne is the perfect crop for the purpose; it is very good, but it has its shortcomings. For example, on certain soils and in parts where the rainfall is very light, it is a tricky crop to get established. Also, it is a rather expensive crop to establish in the Swartland, for there it has to be sown on well prepared fallow land, in contrast to the cheaper practice of sowing it in on newly sown grainland, as followed in the Caledon-Bredasdorp area, where milder climatic conditions permit of successful establishment of the crop in this way.

For the Swartland and other difficult areas the ideal plant for building up the soil and at the same time providing income in the form of grazing must be something still hardier than lucerne, and

a plant which can be cheaply and easily established. But to get such a plant calls for intensive exploration in South Africa and other countries for potentially suitable wild plants, followed by a plant-breeding campaign which should eventually provide a still hardier and more adapted plant than lucerne for these areas.

In the meantime, dryland lucerne is the best plant for our purpose, and we must use this crop. As in other countries, we must practice ley farming and must use lucerne as a semi-permanent pasture in rotation with grain. In most parts of the Swartland this can be done, and with the certainty of deriving great benefits from such practice.

Many farmers are to-day growing dryland lucerne in the Swartland, but thus far only on a small scale. Many, unfortunately, are hesitant to apply the lucerne-grain rotation to their extensive grain-lands, and these are the lands which need it most. There are several reasons for this. One of them is the call, under the present conditions of food shortage, for the production of more grain. Another is the attraction of the present wheat prices. Still another is the belief held by many farmers that, in order to come into the

FIG. 5.—Horses on lucerne pasture near Malmesbury.

improved system, they must at once put down one half or one third of their cultivated land to lucerne. These farmers see difficulties and troubles ahead, but their belief is wrong, of course. What must be done, is to put down a single land of 20 to 50 morgen each year to lucerne. When, in turn, each land has rested under lucerne pasture for $3\frac{1}{2}$ to 4 years, it is ploughed over and the following year it is sown to grain again.

Investigations in this connection are still of too short duration for the final ideal rotation for the Swartland to be known or even forecast, but present knowledge indicates that the following rotation can be applied with great success in that area:—

Lucerne grown for $3\frac{1}{2}$ years, then fallowed in; followed by grain, fallow, grain, fallow, grain, fallow, grain, fallow.

This is a 12-year rotation and, when applied to the cultivated lands of the farm, one third of the land carries lucerne as a grazing

crop, one third carries grain (which may be wheat or oats, or the two crops alternated, according to the farmer's desire), and one-third is fallowed land.

In such a rotation the humus-producing crop—lucerne—alternates at intervals with the humus-consuming crop—grain, and the harm done to the soil by the latter is made good by the former.

If this rotation is compared with the system, at present very commonly followed, of grain—old land—fallow, it will be seen that it permits of the same proportion of the farm land being under grain and under fallow, but that the valuable lucerne now replaces the old land. The soil is rested and brought back into good heart under lucerne in an infinitely better way than when rested as old land. The grain yields obtained on the old lucerne lands are much higher than those obtained under the old system, and this means a reduction in the production costs per bag.

If the suggested rotation is compared with the intensive wheat—fallow system, it is evident that it allows for slightly less land being under grain, but there is vastly improved pasturage on the farm, permitting a sounder livestock enterprise. Furthermore, the rejuvenation of the soil under lucerne allows of greatly increased yields of grain, which will more than compensate for the slight reduction in area.

In rotation experiments at the Langgewens Experiment Station in the heart of the Swartland, the average yields per morgen obtained during the past six years were 13·2 bags of wheat following lucerne, as against 7·7 bags of wheat on fallowed land. The experiments have not yet run long enough to show what the total production over the 12-year cycle will be, but the evidence is such as to show that the lucerne has a very good residual effect for several years after it has been ploughed under.

Finally, the Swartland farmer must take stock of his position, and consider whether it is profitable to continue cultivation of the poor or shallow or steep lands which in 1919 were considered unsuitable for economic wheat production. The lessons of the last few rainy years will have indicated that the very steep lands are too steep for grain growing, and that they should be retired from the cultivation of grain to the no less important rôle of becoming pastures for livestock. The too shallow soils will in time eliminate themselves from grain growing as being economically not productive. The deeper soils of poor fertility, however, under a system of crop rotation with humus-producing crops, will be built up, so that they may also eventually become fields on which grain can be produced economically.

Three Leguminous Fodder Trees:

[*Continued from page* 12.

The trees described above will, of course, yield the best results on fertile soil which is suitable for other profitable crops. The planting of the trees on the best agricultural soil is not, however, recommended. In the drier parts of the country they should rather be planted on the poorer types of soil which are not suitable for better crops, or where the crops are very uncertain. The results obtained in areas where the trees have already been established and are to-day proving a great asset to the farmer, should encourage further plantings of these very valuable fodder trees.

(N.B.—Seeds of these trees are obtainable from the Department of Forestry, Pretoria.)

Nutritive Value of Certain Dried Fruits.

Influence of Size Grades on Chemical Composition.

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IT is only in recent years that the practice of dietetics has become guided by the modern science of nutrition. The regimens of many diet kitchens, and often physicians' diet lists, are still dominated by traditions and empirical notions. Many so-called diets are needlessly complex, unscientific and often, if continued over a long time, positively dangerous because of a lack of nutritional balance that induces deficiency conditions. Too often they are directed only toward the correction or alleviation of a particular pathological state and completely ignore the provision of ample quantities of essentials for normal nutrition. For this reason it is necessary to know the dietary values of the various foods, and in this article an effort is made to discuss the nutritive values and chemical composition of certain dried-fruit varieties, so as to enable us to utilize them to the best advantage.

Methods and Materials.

In the investigation five varieties of dried fruit were used and the grades, usually offered for sale, were analysed in order to ascertain whether size had any significant effect on their chemical composition.

The samples of each variety and grade were taken from the bins of three different dried-fruit pack-houses and in each case samples of not less than two pounds were taken from the different bins. The samples were taken from the whole surface of the bin in an effort to obtain a quantity which would be representative of the whole. Each grade of the different varieties was analysed in duplicate, and the mean values of the analyses of different varieties and grades obtained from the different pack-houses are given in this article.

The numerous difficulties attached to the sampling of dried-fruit samples are fully appreciated, especially since the different varieties of the fruit, as well as fruit from many localities, may all be in one bin. For these reasons the results are given for the varieties in general, and not for particular types from specific localities; this investigation is still in progress and will be reported on at a later date.

The different varieties were all graded by machine so as to comply with the standard fruit-grading regulations, as determined by Government Notice No. 2450 of 1945. All samples were dried in a vacuum oven, moistures determined and subsequent analyses made on absolutely dry material. The whole sample was then ground in a special type of hammer-mill, and portions taken from this for the other determinations. The samples could only be milled or chopped when thoroughly dry, and in order to do this great care had to be exercised not to caramelize the sugars.

Determinations and Analyses.

Total nitrogen determinations were made on accurately weighed one-gramme samples of the dry material by using the Kjeldhal method, as described by Jacobs(1) for plant material. Protein was calculated by using the conversion factor of $6 \cdot 25 \times N$.

Mineral analyses were carried out on one-gramme, absolutely dry, samples. Wet ashing was employed with nitric acid (HNO_3) and perchloric acid ($HClO_4$) for total oxidation of organic material; excessive foaming, during treatment with nitric acid, was avoided by the addition of a few drops of chemically pure paraffin.

Iron(2) was determined by the o-phenanthroline colorimetric method as described by Parks, Hood, Hurwitz and Ellis.

The colorimetric method used for the determination of phosphorus(3) depends on the molybdenum blue obtained when an acid solution of ammonia phospho-molybdate is reduced.

Potassium was determined according to the standard cobaltinitrate reagent method, with the final titration of the excess permanganate of potash with a sodium thiosulphate solution, as described in A.O.A.C., 1937(4).

Calcium was determined according to the procedure recommended by Hillebrand and Lundell(5).

Carotene was estimated according to the revised method of Munsey(6).

The total carbohydrates were determined by inverting the sucrose with invertase in a slightly acid medium to the reducing sugars, which were then determined by the modified Shaffer and Hartman method, as described by Marsh and Joslyn(7).

Nutritive Value of Dried Fruit.

Dried fruits are excellent sources of the quickly digestible hexose sugars, glucose and fructose. The sugar content ranges from about 50 per cent. to 70 per cent., and the calorific value from 1,100 to 1,300 calories per pound.

Compared with meats, peas, dried beans and other foods high in proteins, fruits are poor sources of protein. It is not known whether the proteins of fruits have any special dietary values as these proteins have not been isolated in the pure form, nor has the nature of the amino acids been determined. On the other hand, nuts such as almonds and walnuts, are rich in proteins, but low in carbohydrates. Hence, when one eats nuts with dried fruit, as in a dessert, a highly nutritious and concentrated food combination, furnishing protein, carbohydrates and fats as well as minerals and some vitamins, is obtained(8).

In raisins, most of the carbohydrates are sugars and are quickly and readily assimilable by the body. In figs, there is considerable fibre from the seeds and skins; and in prunes, apricots and peaches, there are considerable amounts of soluble carbohydrates other than sugars. These are probably for the most part digestible and utilizable, but their exact chemical characteristics are not completely known.

Total mineral matter or ash is determined by burning a weighed sample of the fruit material under specific conditions. After ashing it is weighed chiefly for the carbonates of potassium, sodium, magnesium and calcium. In general it may be stated that dried fruits are fair to good sources of iron and copper, rich sources of potassium, and rather poor sources of calcium, when compared with milk. They are very valuable, however, for their sugar content, alkaline ash, mild laxative property and their iron and copper content.

In this investigation efforts were made to ascertain whether the size (as graded by various packers) of the different dried-fruit varieties had a significant influence on the ultimate nutritive value

of the said grades as determined by chemical methods. While the mineral content of fruits may vary materially with variety, maturity and the general growing conditions, the values given are not for particular conditions, but, as described above, are comparative figures for the grades and varieties as a whole.

TABLE I.—*Composition of different grades of dried fruit.*

Variety.	Grade.	Protein.	Carbohydrate.	Ash.	P.	Fe.	Ca.	K.
		%	%	%	%	%	%	%
Apple Rings.......	1 D	4·54	59·2	2·58	0·0135	0·00363	0·027	0·86
	2 D	4·13	56·4	2·11	0·0108	0·00309	0·025	0·93
	3 D	4·05	57·6	2·36	0·0129	0·00343	0·027	0·94
	4 D	4·09	62·8	2·67	0·0124	0·00342	0·027	0·99
Peaches...........	1 D	2·71	68·0	2·97	0·0323	0·00967	0·017	1·227
	2 D	2·11	71·0	2·86	0·0245	0·00521	0·014	1·104
	3 D	2·93	63·8	2·53	0·0534	0·00474	0·021	0·910
	4 D	2·85	65·4	2·87	0·0383	0·00389	0·017	0·913
Pears..............	1 D	4·38	63·8	1·40	0·0304	0·00040	0·025	0·733
	2 D	4·71	64·4	1·39	0·0392	0·00064	0·029	0·741
	3 D	5·06	64·0	1·18	0·0292	0·00029	0·029	0·543
	4 D	4·48	63·2	1·29	0·0297	0·00025	0·028	0·737
Apricots (Royal)....	1 D	6·49	67·6	2·84	0·0448	0·00498	0·023	1·129
	2 D	6·43	66·9	2·72	0·0543	0·00521	0·023	1·170
	3 D	5·84	68·3	2·41	0·0432	0·00547	0·023	1·220
	4 D	6·62	68·1	2·60	0·0504	0·00556	0·022	1·104
Prunes............	50/ 60	2·40	63·3	1·21	0·0155	0·00445	0·031	0·830
	60/ 70	1·99	64·8	1·43	0·0105	0·00393	0·043	0·793
	70/ 80	2·03	63·2	1·63	0·0194	0·00389	0·035	0·804
	80/ 90	2·42	64·7	1·71	0·0183	0·00371	0·041	0·677
	90/100	2·64	62·0	1·66	0·0199	0·00225	0·036	0·826
	100/120	1·98	64·8	1·42	0·0219	0·00267	0·035	0·728

From the above table it is evident that there are minor variations in the chemical composition of the different grades, but in no single instance are these significant. For the constituents determined, it thus appears that the size of the dried fruits has no effect upon the composition of the fruit.

As can be seen, all the fruits are high in potassium. This appears as the salts of organic acids. During metabolism, the free organic acids, as well as those combined in the form of salts, are oxidized to carbon dioxide and water, or are otherwise destroyed, leaving a basic residue of the bicarbonates of these heavy elements. Dried fruits are very important sources of these alkaline salts, which in turn play a very important rôle in the pH of the blood(9). Generally, it is thought that fruits and their dried products cause acidity in the stomach, but this is a misconception.

TABLE II.—*Alkalinity and acidity of the ash of several foods.* (After H. J. Heintz & Co.) (16).

Food (dry).	Acidity as ml. $\frac{N}{10}$ NaOH per 100 gms. food.	Alkalinity as ml. $\frac{N}{10}$ H_2SO_4 per 100 gms. food.
Apples	—	—
Apricots	—	24·6
Figs	—	30·0
Guavas	—	32·9
Peaches	—	8·0
Pears	—	5·9
Raisins	—	4·2
Bread	4·0	33·5
Barley (pearl)	10·4	—
Almonds	—	12·0
Peanuts	3·9	—
Walnuts	7·8	—

From Table II it is clear that, in general, fruits leave an alkaline residue on digestion owing to an excess of basic elements over mineral acid elements, e.g. phosphorus and sulphur, whereas cereal products and most nuts leave an acid residue over basic elements, e.g. potassium, calcium and sodium.

Dried fruits are of great value in promoting blood generation and it has been proved that apricots, peaches and prunes (Whipple & Whipple) are of great value in promoting haemoglobin formation during severe anaemia. These workers further state that the daily addition of 200 grammes of a cooked fruit to a standard diet may cause an average output of 40 to 50 grs. of haemoglobin per two weeks' period, and that it also appeared to promote red-cell formation.

In addition to having direct nutritive values, dried fruits also act as laxatives.

Vitamin A does not occur, as such, in fruits and vegetables, but is present as carotene, a precursor of vitamin A which is formed from the former in the body. It usually is present as beta-carotene, and to a much smaller degree, as alpha-carotene or as cryptoxanthin. In this investigation the beta-carotene content of the different fruits was determined, and the values are given in Table III.

TABLE III.—*Vitamin A content of dried fruits.*

Variety.	Carotene, expressed as I.U. Vit. A per 100 grammes fruit.
Apricots	7,000
Peaches	3,100
Pears	20
Prunes	1,700

Conclusions.

No significant differences in the carotene values of the different size grades of the different dried fruits could be ascertained. The above values are the average figures of all the grades.

In no case could any vitamin C be determined in the samples.

Dried fruits contain small quantities of the other vitamins, but these could not be determined in this investigation.

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Wheat Stunt—A New Cereal Disease.

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DURING an inspection of wheat fields in the Transvaal in September 1945 the writer noticed plants with a very stunted appearance (Fig. 1). Closer examination showed that the leaves had a number of yellowish stripes very similar to those occurring on maize, sugar-cane and certain wild grasses affected by "streak" disease. It was later discovered that this condition had long been known to farmers in the eastern Transvaal under the name "kroes-koring". It was, however, invariably ascribed to poor seed or unfavourable climatic conditions.

FIG. 1.—Plant infected with "wheat stunt" disease, growing between two healthy plants.

Symptoms.

The most characteristic symptom of the trouble is the occurrence of narrow yellowish-green or chlorotic streaks along the leaf veins. A plant may show these signs at any stage of its development. When a plant emerges from the soil, the first leaf to unfold is always normal, even though infection is contracted immediately. The first streaks, usually few in number, appear towards the base of either the second or third leaf (Fig. 2). Thereafter on the succeeding leaves the streaks cover an increasingly larger area until the entire length of the leaf is marked with parallel rows of streaks.

FIG. 2.—Symptoms of the disease on young plants (second leaves).

The width of the streaks is usually uniform, namely, about $^{1}/_{100}$ inch, but their length varies from $^{1}/_{100}$ to $\frac{1}{8}$ of an inch. If the infection is severe, these short streaks may join to form longer lines running parallel to the veins. Fully streaked leaves are usually much shorter than corresponding healthy ones and often show bent or curled tips (Fig. 3). The haulms also remain shorter but tillering is stimulated, with the result that affected plants are small and have a bunched appearance (Fig. 4). This "stunting" effect is a very important character in recognizing the disease in the field. Dwarfed plants produce only a few shoots of about half the normal length. Their ears either bear isolated grains or do not form seed at all. Bearded varieties usually show some bent awns.

Plants infected at an early age may die prematurely. When a group of plants are affected in this way, the trouble may easily be mistaken for an outbreak of "take-all" root rot. Usually, however, diseased plants are found scattered in the field.

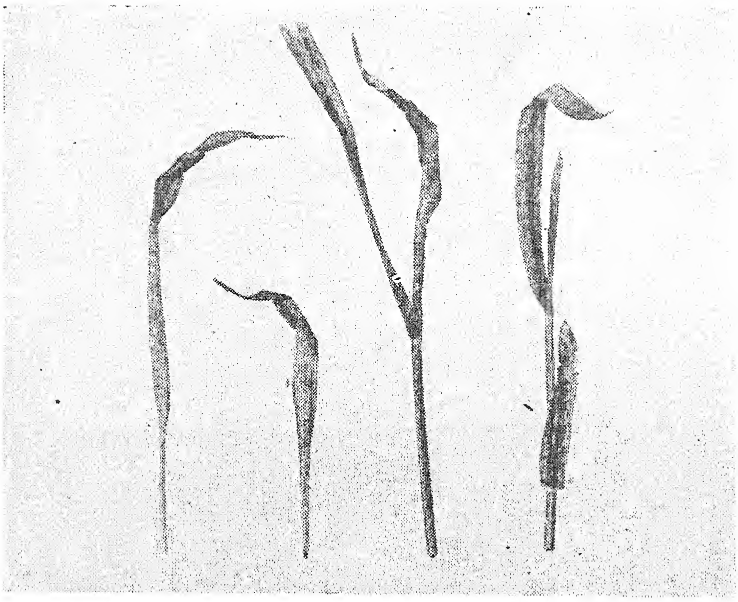

FIG. 3.—Curled and bent leaf tips of infected plants.

Cause of the Disease.

The disease is caused by a virus, i.e. an invisible infectious agent which occurs in the cell-sap of infected plants. Among the various virus diseases there are some that can be spread by bringing the sap of a diseased plant into contact with that of a healthy plant, while others are transmitted only by the sucking action of insects. The disease which is here described, and which is to be called

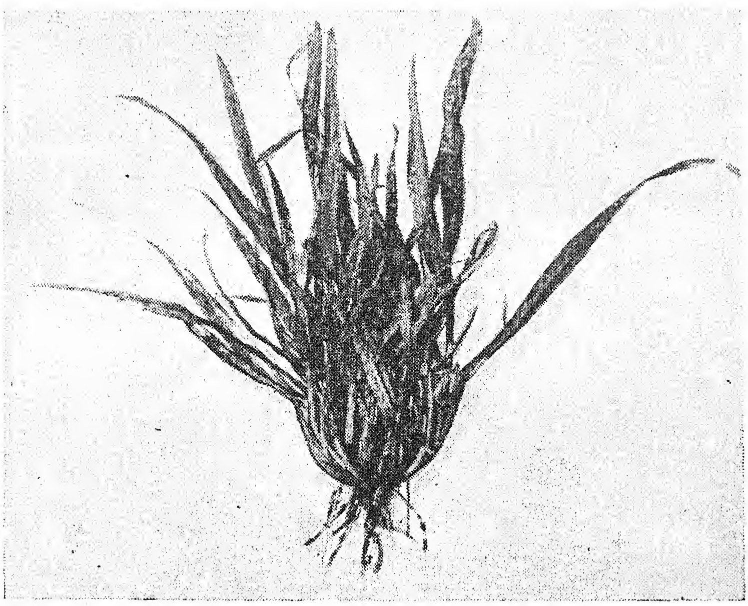

FIG. 4.—Young diseased wheat plant showing excessive tillering and bunchy appearance.

" wheat stunt ", belongs to the latter group. The vector or transmitting insect is a leafhopper, *Cicadulina mbila*, Naudé, which is also known to transmit the " streak " diseases of maize, sugar-cane and various grasses. Green-house tests under controlled conditions have shown that the virus causing wheat stunt is identical with the A-form of maize-streak virus.* Thus it is not surprising that wheat infected with " stunt " disease has so far been found only in those wheat-growing areas where the streak disease of maize is known to occur, i.e. the districts of Lydenburg, Middelburg, Pretoria, Brits and Rustenburg.

Varietal Susceptibility.

While some wheat varieties are resistant to the disease, those that are most popular in the Transvaal are unfortunately all very susceptible. Of the various varieties tested by the Division of Botany and Plant Pathology, only four appeared to be immune as indicated in the table below:—

Table showing the comparative susceptibility to wheat stunt *of different wheat varieties, as shown by seedling infections.*

Immune (No plants infected).	Resistant (0–15 per cent. plants infected).	Fairly susceptible (15–60 per cent. plants infected).	Very susceptible (60–100 per cent. plants infected).
Renown 461†.......	Bossiesveld 430.....	Pelgrim 410........	Rooi Klein 465.
Renown 723........	Renown 570........	Scheepers 476......	Wolkoppie 309.
Reward 632........		Spring Early 698...	Kleintrou 675.
Reward 546........		Lalkasarwali 487....	Krüger 473.
Marquis 489........		Rooi Egipties 472 ..	Rooi Diedericks 520.
Regent 580........		Thatcher 577.......	Sterling 515.
			Durum 650.
			Beltista 284.
			Spilhaus 615.
			Kaal Indië 376.

† The number attached to each variety refers to the identification number under which it is registered with the Wheat Industry Control Board which kindly supplied us with seed for the tests.

Destructiveness.

It has been observed that wheat stunt is particularly severe in early-sown wheat and in wheat under irrigation. These facts are apparently closely connected with the conditions which govern the occurrence and spread of the leafhopper. Since the insect is very active only during warm weather, it is easy to understand that the disease occurs mainly in early-sown wheat because of the many insects present and the relatively high temperatures. During the past season a severe infection was noticed in fields which were sown in the middle of April, while few or no signs of the disease could be found in wheat which was sown a month later. On some of the early-sown lands more than 50 per cent. of the plants were diseased.

The stunted appearance of infected plants is often aggravated by attacks of aphids. It is therefore highly probable that much of the damage which has been reported in the past as due to aphids was in fact caused by the above-mentioned disease.

A comforting fact about the disease is, however, that, like maize streak, wheat stunt is not carried in the seed.

* Nomenclature of A. P. D. McClean in: Some forms of streak virus occuring in Maize, Sugar cane and Wild Grasses. *South Afr. Dep. Agric. Sc. Bull.* (in press).

 [Continued on page 44

Grow More Leguminous Crops.

Dr. John Fisher, Principal, College of Agriculture, Cedara.

THERE are several reasons why it is absolutely imperative that more leguminous crops should be grown. In the first place, the continued shortage of nitrogenous fertilizers has made it more difficult than ever to produce pasture grasses with a high protein content for the feeding of dairy cows. Secondly, the restrictions placed on the export of groundnuts from India have resulted in there being practically no groundnut meal or cake available for cattle feeding. And, thirdly, the increasing demand for the protective foods such as milk, butter, eggs, etc., for human consumption cannot possibly be met unless feeds with a high protein content are available.

The digestive system of an animal cannot produce protein from a feed which does not contain it. Livestock can only obtain their proteins from plants or feeds of animal origin which in turn derived their protein from plant sources. There is no original source other than plants. Leguminous plants are richer in proteins and other nutrients, notably minerals, than are the grasses and cereals, the normal food of farm livestock.

Young suckling animals which receive adequate amounts of milk, thrive so well and gain so rapidly in weight because their food is rich in digestible protein and absorbable minerals, but there is often a drain on the dams due to a shortage of protein in their rations.

TABLE I.—*Percentage Composition of Feeds.*

Foodstuff.	Water.	Ash.	Crude Protein.	Fibre.	N Free Extract.	Fat.
Cereal Grain.						
Maize, grain	10·5	1·5	10·1	2·0	70·9	5·0
Wheat, grain	10·2	1·9	12·4	2·2	71·2	2·1
Barley	9·3	2·7	11·5	4·6	69·8	2·1
Oats	9·2	3·5	12·4	10·9	59·6	4·4
Rye	9·4	2·0	11·8	1·8	73·2	1·8
Rice (rough)	9·6	4·9	7·6	9·3	66·7	1·9
Buckwheat	12·1	2·1	10·8	10·3	62·3	2·5
Kaffir corn	11·8	1·7	11·1	2·3	70·1	3·0
*Oil Seeds.**						
Cotton seed	9·4	4·6	19·5	22·6	24·9	19·0
Flax seed	9·2	4·3	22·6	7·1	23·2	33·7
Leguminous Grains.						
Field peas	9·2	3·4	22·9	5·6	57·8	1·1
Garden peas	11·8	3·0	25·6	4·4	53·6	1·6
Peanuts, with hull	6·5	4·1	20·4	16·4	16·4	36·2
Peanuts, without hull	6·0	2·2	26·8	2·6	17·5	44·9
Soya beans	9·9	5·3	36·5	4·3	26·5	17·5
Cowpeas	11·6	3·4	23·6	4·1	55·8	1·5
Horse beans	12·6	3·8	26·2	7·1	49·4	0·9
Legume Hays.						
Lucerne	8·6	8·6	14·9	28·3	37·3	2·3
Clover, red (in bloom)	13·9	7·4	13·1	23·1	39·1	3·4
Clover, white (in bloom)	8·1	8·0	16·2	23·2	41·6	2·9
Lupins	7·8	8·8	15·8	20·8	43·5	3·3
Soya beans	8·6	8·6	16·0	24·9	39·1	2·8
Cowpeas	9·7	11·9	19·3	22·5	34·0	2·6
Vetches	7·1	8·2	17·3	26·2	36·2	2·5

* These oil seeds are not largely grown by the South African farmer.

TABLE II.—*Percentage Composition of Grasses.*
(All results are calculated on the absolutely dry material.)

	Crude Protein.	Crude Fat.	Soluble Carbo-hydrates.	Crude Fibre.	Total Ash.	Soluble Ash.	Lime.	Phosph- Oxide.	Nutritive Ratio.
Red grass, closely grazed	10·6	3·4	50·6	28·0	7·4	3·9	0·38	0·36	1—5·5
Paspalum, closely grazed	17·1	4·4	42·8	27·0	7·9	6·3	0·60	0·53	1—3·1
Kikuyu, closely grazed	23·3	4·1	42·6	19·9	10·2	8·9	0·37	0·84	1—2·2
Cocksfoot, cut September	17·5	5·1	43·7	23·1	10·6	8·0	0·82	0·56	1—3·2
'Mfufu (young) Pennisetum purpureum	22·6	2·6	38·3	25·4	11·2	8·7	1·04	0·81	1—2·0
The following data all refer to grasses in the early flowering stage and give the average of several samples.									
Veld, Red Grass	6·0	2·8	49·7	34·9	6·7	—	—	0·21	1—9·3
LAND GRASSES.									
Digitaria sadnuinalis	14·9	2·9	43·7	28·6	10·7	—	—	0·52	1—3·4
Eleusine indica (Rapoka)	13·7	2·3	45·2	31·4	8·3	—	—	0·39	1—3·7
Panicum laevifolium	9·4	2·0	45·4	35·3	8·5	—	—	0·28	1—5·3
Panicum proliferum	13·1	2·3	45·8	31·5	8·3	—	—	0·29	1—3·9
Setaria imberbis	10·0	2·4	46·0	33·1	9·0	—	—	0·36	1—5·2

If, therefore, the primary producer cannot obtain the necessary protein-rich feeds, the production of his livestock will inevitably fall, unless he supplements the shortage by growing more protein-rich feeds on the farm. Since the farmer should now plan his cropping system for the coming year, he must decide to grow a considerably increased acreage of leguminous crops.

The accompanying tables show he actual analyses of cereal grains, leguminous grains, grass or cereal hays and leguminous hays. It will readily be seen from the figures given that the legumes are much richer in protein content than the cereals, and also that they have considerably more ash or mineral matter. A further important point is that the true or pure protein (the most valuable kind) is higher in the legumes than in the other foods.

The leguminous grains show twice the protein content of cereal grains, the ash content also being generally nearly twice as high. For these reasons the leguminous grains are much more valuable than the cereal grains. But the bulk of farm livestock live largely on roughages, so that when we turn to the compositions of grass hays and leguminous hays we realize how much more valuable the legume hays are.

Legume growing connotes a rather higher standard of farming than mere grass growing, so that the farmer who increases his legume production, is definitely on the "up grade", but only an acre or so of legumes is not sufficient as the appetitite of stock will only be whetted.

Soil and Climatic Requirements of Legumes.

Soil.—It is frequently stated that legumes will not grow in acid soils. This, however, is not true, as there are certain legumes which are quite tolerant of acid soils. Mention can be made of vetches, lupins, soya beans and some clovers, particularly wild white clover, the best of the grazing clovers. Lucerne and cowpeas are more particular and do not tolerate the same acidity, though wild cowpeas and *Crotalarias* are found in sour veld. It can generally be accepted that where there are wild species growing in the veld, the cultivated sorts can be grown in adjacent arable soils. This is probably due to the fact that if there are wild legumes, then the organisms responsible for the nodules on the roots of the legume are present and the sown crops can therefore obtain the nitrogen they require. If the bacteria are absent, however, the legumes will not thrive, perhaps not even grow. It has come to be generally accepted that soya beans are better for sourveld areas, whilst cowpeas may do better on sweet soils. In this connection, however, climatic conditions must be taken into consideratic as well. A free, sandy, loamy soil is suited to groundnuts. Heavy soils which tend to set hard after rains and under a burning sun are unfavourable to the growth of the groundnut, while soils deficient in lime tend to produce many groundnuts with empty shells. All farmers in suitable ares are urged to grow as many acres of groundnuts as possible, as the whole crop is excellent stock feed.

Climate.—The climatic requirements of legumes also vary considerably. The velvet bean, for example, is a tropical legume and grows to perfection only where the climate is hot and the season long. Hence, it is the most suitable legume for the coastal belt where it does as well as, or perhaps better than, sunn hemp. Both are used in the sugar belt as green-manure crops, being seldom grown as stock feed.

The cowpea and soya bean are summer legumes for the midlands and even the high veld. There, the planting time of these crops can be so regulated that they will be ready for making into hay when the dry weather sets in, and the soil is dry.

Vetches, Lupins, Subterranean Clover, etc.

Where these legumes are to be mixed with the maize in the silo, the planting times must be so arranged that the crops will yield the largest bulk for ensiling. Vetches, lupins and subterranean clover are very suited to the wet winter conditions experienced in the western Cape Province. In addition, they all withstand considerable frost. The most suitable vetches are the spring vetch, the hairy vetch (Vicia villosa) and the purple vetch, which are generally sown together with a cereal up which they can climb. The crop is often used for silage, but, when grown alone, it may also be made into hay. Where the crop is grown alone, however, the plants lie prostrate on the ground and much of the material goes to waste. If seed of these vetches can be grown relatively cheaply, their production should be considerably extended in the western Cape Province or even in the dry winter areas, as they are able to withstand adverse conditions until the arrival of the spring rains, when they shoot up quite rapidly. The second growth of the vetch, after grazing or cutting, sets seed fairly readily.

Lupins will not only grow in poor soils, but will even do well under dry conditions and provide green feed in September, which is usually the most critical month in the year in so far as feed is concerned. As some lupins are decidedly bitter, however, these should rather be used for green-manuring purposes, and preference given to the sweet lupin for feeding purposes, as stock eat it quite readily.

Subterranean clover is an annual legume which is suited to dry summer and wet winter conditions. It makes its growth during the winter and early summer, and seeds freely, producing enough seed to establish the crop the following season. It is suitable for grazing and is a very useful legume for this purpose. It is not a success, however, when sown to grow during the heat of summer, as it does not appear to be able to adapt itself to hot moist conditions and long days.

Under conditions prevailing in the western Cape Province, the winter legumes are relatively easy to grow, but as the greatest need in that area is for a suitable *summer* legume, the problem can be solved by growing dry-land lucerne. Lucerne should be grown wherever climatic conditions are suited to its production, as there is always a demand for this valuable crop from areas where it does not grow.

Sunn hemp can be grown under summer-rainfall conditions wherever the season is long enough to allow horse-tooth dent mealies to ripen. It is a fair legume for hay, though rather stalky if allowed to become too old before being cut, and if sown somewhat thinly. Sunn hemp should be sown thickly and cut on the early side where it is intended to be used for hay.

Much more attention should be given to soya beans and cowpeas in the summer-rainfall areas where perennial legumes like lucerne and kudzu do not grow well. The cowpea should be grown in the sweeter areas where the atmospheric conditions are drier. If grown in the sourveld areas, it is very liable to suffer from leaf diseases and

loses most of its leaves in February and March, this being a decided drawback. The soya bean is our most healthy summer legume, as it is seldom subject to leaf blights, and is not attacked by weevils in the seed. It should therefore be grown on a scale many times greater than it is to-day.

As will be seen from the tables, the protein percentage of soya beans is roughly 3½ times that of maize. So, for example, 5 bags of soya beans (200 lb. per bag) will contain 365 lb. of protein, whereas 5 bags of maize (200 lb. per bag) will contain only 101 lb. of protein, while a comparable weight of soyabean hay (1,000 lb.) will contain as much as 160 lb. of protein.

Points to Bear in Mind.

There are a few points which must be stressed in regard to legumes. Being considerably richer than cereals they withdraw more from the soil in the form of nitrogen, phosphates and lime, and in some cases potash also.

If there are no nodules on the roots of legumes, and the crop is removed in its entirity from the soil, the soil will be poorer in nitrogen than it was before. This point is not always fully appreciated, and farmers have been disappointed with the results obtained from a cereal crop following a legume. This is easly explained by the drain of nitrogen which must result if there is no nodulation.

All legume crops should have large numbers of nodules on their roots if they are to enrich the soil as well as give hay and grain with a high protein content, but they do not all have the same strain of nodule organisms on their roots. Some nodule organisms can function on several legumes, but others are specific to certain legumes. The soya bean requires its own special organism which is not found in our South African soils until they have been inoculated with it.

All soils in which the selected legumes are to be grown, should be inoculated the first year the seed is sown. At first there will be only a few nodules on the roots of the legume. During the second year the crop should therefor again be grown on the same field and the seed again inoculated. After that there will be enough organisms in the soil to grow the crop without further seed inoculation every year, even if the legume crop is now grown only once in 6 years.

Cross-Inoculation.

The plants in each of the following groups can cross-inoculate, but the various groups do not cross-inoculate.

Lucerne Group.—Alfalfa, White Clover (sweet), Yellow Sweet Clover, Hubam, Bur Clovers, Black Medic (Yellow Trefoil), Bitter Clover, Button Clover, and Fenugreek.

Clover Group.—All trifolium clovers—Red, Mammoth Red, Medium Red, Alsike, White Ladino, Wild White, White Dutch, Crimson, Hop Clovers, Cluster, McNeill, Strawberry, Subterranean, Berseem, Zigzag, Rabbitfoot, Persian, Carolina, and Buffalo Clover.

Pea Group.—Garden Peas, Field Peas, Canadian Field Peas, Sweet Peas, Perennial Peas, Austrian Winter Pea, Tangier Peas, all vetches (Hairy, Hungarian, common, Monantha, Purple, Oregon), Broad beans, and lentils.

Bean Group.—Garden beans (String, Snap, Wax), navy, kidney, Pinto, and scarlet runner.

Cowpea Group.—Cowpeas (Black-eyed peas or Black-eyed beans), peanuts, Lima beans, velvet beans, Crotalarias, Kudzu, Florida, Beggarweed, Mung beans, Jack beans, Partridge peas, Pigeon peas, Tepary beans, Tick Trefoil, Adzuki beans, Alyce Clover, and Mat beans.

Lespedeza Group.—All varieties of Lespedeza-Japan clover, Common Lespedeza, Korean, Kobe, Tenessee 76, and Sericea.

Soya Group.—All varieties of soybeans, including edible soybeans.

Special Cultures.

The following legumes require special strains of legume bacteria: Lupins (all varieties), Sesbania, Black Locust, Dalea, or Woods' Clover, Crown vetch, Carbanzo or chick peas, Cuar, Lotus, or Bird's Foot Trefoil, Cracca, or Tephrosia.

Hitherto reference has been made mostly to the cultivated legumes, i.e. soya beans, cowpeas, sunn hemp, velvet beans, etc., but there is also a great need for these legumes amongst our grazing plants, i.e. in our pastures. If South Africa is to make the same progress as dairying countries like Britain, Holland, Denmark and New Zealand, all of which have clover-rich pastures, she must have more pastures with legumes in them, and particularly more clover-rich pastures.

When our pastures (established pastures) are clover-rich, we shall have larger and cheaper production of dairy products. The legume which is pre-eminently the legume for grazing when mixed with grasses, is Wild White Clover, of which there are several strains. In South Africa, the New Zealand strain of Wild White Clover seems preferable to the Danish, Dutch, or even the Kentish varieties.

When clovers are first sown the seed must be inoculated if the plants are to last for several years. Where it is desired to increase the percentage of clovers in pastures, the grazing must be fairly heavy to prevent grass dominance, and insoluble phosphate must be applied. If, however, it is desired to suppress the clovers to some extent, then soluble nitrogenous fertilizers and soluble phosphates should be applied and the pastures grazed more lightly. The management technique to maintain clovers in pastures is not very difficult.

Planting Legumes Together with Row Crops.

Many of the legumes mentioned above can be grown alone or together with row crops such as maize. Where bunch types as opposed to running types are cultivated, the rows should be such that the crop will canopy by about February or March. In the case of soya beans, the rows should be 26 in. to 28 in. wide. They will then canopy and this will keep down weeds and prevent pounding of the soil by torrential rains. When a canopy has been formed, surface rooting of the plants takes place rapidly, to the benefit of the crop.

Where the practice of wide spacing of maize is followed (rows 7 ft. 6 in. apart), 2 rows of soya beans 28 in. apart can easily be planted in each lane between the rows of maize. The soyabeans can

The Black Maize Beetle.

The black maize beetle *Heteronychus Sanctae Helenae* has appeared in alarming numbers in certain districts on the north-eastern Orange Free state. The insect is indigenous, having been known for many years in almost every part of the country. As a rule the population of the insect is insignificant but this year the concentrations on certain areas are so strong that the pest may possibly threaten the maize crop. On many farms two successive plantings have failed to produce a stand of grain on the lands. Moreover, the insect population is so large that it would be foolish to hope that further plantings will be of any use on such infested farms. Investigation has revealed that as early as last year the pest was already causing considerable damage, but this was regarded as of a transitional nature. The reason for this exceptional increase in numbers is unknown.

Normally, the insect is, in so far as significant numbers are concerned, confined to certain patches on grey sandy ridges. These patches usually occur in depressions and give the impression of shallow pans, which, however, are not clayey. The soil in such depressions is, however, finer and looser than elsewhere and also of a lighter colour. It has now been established that for some unknown reason, the insects during the past two years have not only made their appearance outside these patches, but have also multiplied, with the result that many extensive infestations are now to be found. Serious damage is being caused by the adult beetle which is inclined to bore along the stalks of young maize plants in particular, and to feed on the subterranean part of the stalk. The result is that the young plants soon disappear; the damage is caused throughout the summer so that even fully-grown plants succumb in course of time. All cereals, including kaffircorn, wheat, oats and teff are liable to attack, but plants such as beans, cowpeas and other legumes appear to be resistant.

The life-cycle of the pest with its manifestation in four forms, viz. the egg, the larva or caterpillar, pupa and adult beetle is typical of that of beetles. As a rule, the beetles are very numerous from September to March and for the remainder of the year, absent or scarce. The adult beetle which resembles a small dung-roller, has a pitch-black colour and a short, firm, cylindrical body about half an inch in lenght. The beetle appears at night but again crawls into the ground so that it can be seen very seldom. The larva and pupa are found at a depth of four to six inches in the ground; ovipositing takes place in the ground. The insects are most vulnerable in the pupa stage which is spent in a dormant state in special underground cells. The best measure of control exists in the breaking up of these cells by frequently pulverizing the soil between August and October, when the insect is incapable of making new shelters and consequently succumbs. This period is now past and only adult beetles are to be seen. Experience in regard to this beetle is limited, but from what has been reported from other places, it definitely appears to be profitable to collect the beetles each morning at the place where they burrow into the ground and to destroy them. Good results have been obtained from D.D.T. dust which, mixed with ground, has been spread around the stems and incorporated into the ground. For maize it will probably be helpful if re-planting is contemplated, to mix one part of 5 per cent D.D.T. with 9

parts of soil and to apply the insecticide by means of a fertilizer broadcaster.

In the prevailing circumstances the farmer may perhaps be well-advised to plant his lands to cowpeas and beans or to sow buck-wheat or even teff this year. Potatoes are not immune. It is expected that more definite advice will be available next year.

(Division of Entomology, Pretoria.)

Nutritive Value of Certain Dried Fruits :—

[Continued from page 28.

Acknowledgments.—The author wishes to thank the Dried Fruit Packers' Association for supplying many of the samples, as well as for their keen interest in the project, and also the Dried Fruit Board for the samples received from them. Special acknowledgments go to Miss M. Vorster and Mr. O. J. du Plessis for their valuable assistance in the analysis of the samples.

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Grow More Leguminous Crops :--

[Continued from page 38.

be planted when the maize is 18 in. to 2 ft. tall. The soya beans will then be ready to be mown for hay just when the maize is ready to be cut and stooked. Maize rows with the above spacing between the rows allows two rows of beans to be cut with the mowing machine.

The creeping or running character of the common cowpea, whilst advantageous as a soil cover and protector, presents considerable difficulty in harvesting. On the other hand, the upright types are easier to handle, but normally give a considerably reduced yield as compared with the runner types, which should therefore rather be planted together with a row crop such as maize for support.

Army Worms.

As a rule army worms are not detected until they are two to three weeks old and have already done considerable damage. This is unfortunate, since by then they have already spread widely and become strong, and control measures cannot be effectively applied. This state of affairs is, however, unnecessary since it is possible to detect the pest at a very early stage.

With the exception of the lowveld where outbreaks often occur as early as November, the worms appear from the middle of January to the end of April, so that normally the pest may be expected this time. The two chief factors conditioning an early outbreak are hot weather, especially hot nights, and an abundance of young luxuriant grass or grain.

The hot nights are a prerequisite, otherwise the moths cannot deposit many eggs. The presence of young grass is essential since the caterpillars, while very young, cannot exist on older grass. These conditions obtain in the pastures under certain tropical conditions. If the veld has been soaked early and repeatedly by rain, it is to seed by the middle of January and then no longer presents a suitable breeding place. Should the veld, however, be grazed very short or be burnt or beaten down by late hail storms, it will by this time again be young and juicy and thus constitute ideal breeding places. On lands young teff and other grasses are most suitable and moths are inclined to select such spots for ovipositing. In maize lands, however, no eggs are deposited unless there are volunteer grasses such as sweet grass. In teff lands and in the veld the eggs are usually deposited in patches, unless the land or camp is fairly small. Consequently, the initial damage is done in patches and not over a large area. Such patches are easily discernable since they are of a somewhat lighter colour. At that stage the worms are usually very small and may be green in colour, since it is only at a later stage of their life that they turn black. Even before they can be easily seen many of them will land in the turn-up of trousers worn by a person walking through infested land and initially, this is a good test for infestation.

As soon as the infestation is discovered, control measures should be applied, but previous organization is necessary. One of the best methods employed today is the utilization of a dusting pump for dusting infested spots in the veld or land with an insecticide. A handy powder blower costs about £6 and has a capacity for holding about 20 to 40 lb. of powder. A morgen can easily be treated in a matter of an hour or two. Various suitable powders are available. A 5 per cent. D.D.T. insecticide has been found most suitable for destroying the worms in the first four instars. Worms of the fifth and sixth instars are almost fully developed and at this stage criolite powder is a more effective insecticide. Depending on the age of the caterpillars, about 10 to 20 lb. of insecticide per morgen is required for good results. Criolite costs about four pence per lb. and D.D.T. about sixpence. This treatment is definitely worth while. Not only does it save the land or veld but it also prevents the insects from spreading—the factor which counts for the most extensive losses.

It is much cheaper to buy the powder wholesale and, if farmers' associations and organizations keep a good stock, say, 2 tons of powder, for common use, and also five or six pumps, outbreaks could be coped with. (Division of Entomology.)

Making Provision for Winter Feed.

J. T. A. Loubscher, Extension Officer, Döhne.

THE recent drought in the Border area, has once again sharply reminded farmers of the importance of making provision for winter feed. Stock losses due to lack of condition were exceptionally high, and could have been greatly reduced if proper provision had been made for the winter months.

The main districts of the Border area are Komgha, Victoria East, East London, Kingwilliamstown, Stutterheim and Queenstown. Since the writer is not acquainted with conditions in the Queenstown district, however, this area will not be discussed here.

Winter feed can be provided mainly in the form of hay, established pastures and crops, and silage.

Fortunately the greater portion of this area is well suited to the production of these types of feed.

Hay.

For present purposes we are concerned chiefly with the making of hay from veld grass and established crops.

Veld-grass hay.—Although the nutritive value of this type of grass hay is not particularly high, viz. 5·9 per cent. protein and 0·23 per cent. phosphate, it provides for the animals needs during winter or in times of drought. As long as there is a good supply of veld-grass hay, there need be no fear of cattle dying of hunger. During a period of five seasons on the experiment farm at Döhne, it was found that cattle kept on a ration of veld-grass hay alone, lost only 70 to 90 lb. in weight during winter. If cattle have to subsist on veld alone during winter, a decrease of 300 to 400 lb. in weight, or even more, may be expected.

Apart from the value of the hay itself, haymaking plays an important rôle in the effective management of the veld. It eliminates untimely and unnecessary burning of veld, it facilitates veld control and encourages the growth of a thick mat where formerly, as is too often the case, only scattered tufts of grass appeared.

It is realized that veld-grass hay cannot be made everywhere, owing to the presence of stones, thorn trees, or because of unfavourable topography, etc., and on such areas the farmer must, to a certain extent, resort to veld burning, in order to remove the surplus old grass from the veld, but even then this should take place only once every three years or more. If the veld *must* be burnt, this should be done after the first spring rains, when the lowest growth is still damp and will not be burnt off.

Various effective methods of grazing control for the Border area have been tested out, and in most of them the making of veld-grass hay plays an important rôle. If the grass is cut while still in the flowering stage, as many as two cuttings per season, with a yield of 1 to 1½ tons of hay per morgen, may be obtained.

If weather conditions and the density of the stand are favourable, grass cut in the morning may be stacked the same evening.

In the Border area veld-grass hay consists mainly of red grass (*Themeda triandra*), koperdraadgras (*Elyonurus argenteus*), rooisaadgras (*Tristachya hispida*), stick grass or spear grass (*Heteropogon contortus*) and types of taaipol (*Eragrostis spp.*)

Hay from cultivated crops.—Cultivated crops consist mainly of perennials such as lucerne, Rhodes grass, *Setaria* species, and annuals such as Japanese millet, teff, soybeans and cowpeas.

All these crops cannot be grown everywhere in the Border area. Cowpeas, for instance, do not thrive in Stutterheim, since the crop is subject to blight. On the other hand, it grows well in Kingwilliamstown, especially under irrigation.

Most of the above-mentioned grasses will yield 4 to 5 tons of hay per morgen; soybeans and cowpeas 2 to 3 tons. Good results are also obtained with a mixture of teff and Japanese millet (12 lb. of seed of each per morgen).

In most cases these crops may be sown or planted from September to January and in addition to hay, they provide excellent summer and autumn grazing.

Established Pasturage.

In addition to the above-mentioned grasses and crops, oats, barley, clover-grass mixture, rape, turnips and mangels may be planted or sown for use during winter.

In spite of the disadvantages attached to the continuous cultivation of annual crops, barley and oats are at present very popular. Fortunately lucerne, the clover-grass mixture and the above-mentioned perennial grasses are rapidly gaining ground.

The clover-grass mixture consists of 8 lb. of *Phalaris tuberosa*, 6 lb. of Chilean red clover, 6 lb. of wild white clover, 4 lb. of subterranean clover, and 8 lb. of Italian rye-grass per morgen. Excellent results were obtained with this mixture at the Döhne Experiment station as well as in co-operative tests by farmers. Since drought is the limiting factor during the winter months, it is recommended that this mixture be sown under irrigation.

When clover and lucerne are sown for the first time, care must be taken to have the seed inoculated with the correct group of bacteria for the formation of root nodules. If the soil is acid, an application of 2 to 4 tons of agricultural lime per morgen is indispensable for lucerne.

A practice which is meeting with considerable approval in milk-producing areas such as Kingwilliamstown, Komgha and East London, is to sow 30 to 40 lb. of Italian rye-grass between the rows when soybeans and maize receive their last cultivation. In this manner valuable grazing is provided for a period of at least two seasons after the main crop has been harvested.

Silage.

Silage is undoubtedly our most important winter feed. It is cheap and can easily be produced during summer. If treated correctly, practically any crop may be used for silage.

In this area babala, Napier fodder, *Setaria* grasses, lucerne, maize, soybeans and cowpeas are the most important silage crops. If the first-mentioned four groups are cut in good time, they will provide excellent aftermath grazing.

From the following figures of yields per morgen it will be seen that these crops yield large quantities of silage material: babala, 25 to 30 tons; Napier fodder, 30 to 40 tons; *Setaria* Kabulabula 1185, 40 tons; and *Setaria* kazungula 1192, 30 tons.

When making silage, special care should be taken to cut the plants at the right stage of development, and to ensile the crops according to instructions, in order to obtain a palatable product with a high nutritive value.

Even cultivating only a few of these crops, will enable farmers in the Border area not only to produce more, but to apply a proper system of rotational cropping which will maintain and even build up the fertility of their soil.

Wheat Stunt—A New Cereal Disease :—

[*Continued from page* 32.

Control Measures.

Since the causal virus lives principally on the maize plant, wheat farmers in the bushveld areas and the so-called bankenveld are advised against growing maize as a summer crop. If planting of some maize for local use is unavoidable, preference should be given to the streak-tolerant Barberton strain of Hickory King. This is at present the only white maize variety which affords a sufficient degree of protection against unlimited multiplication of the wheat stunt virus.

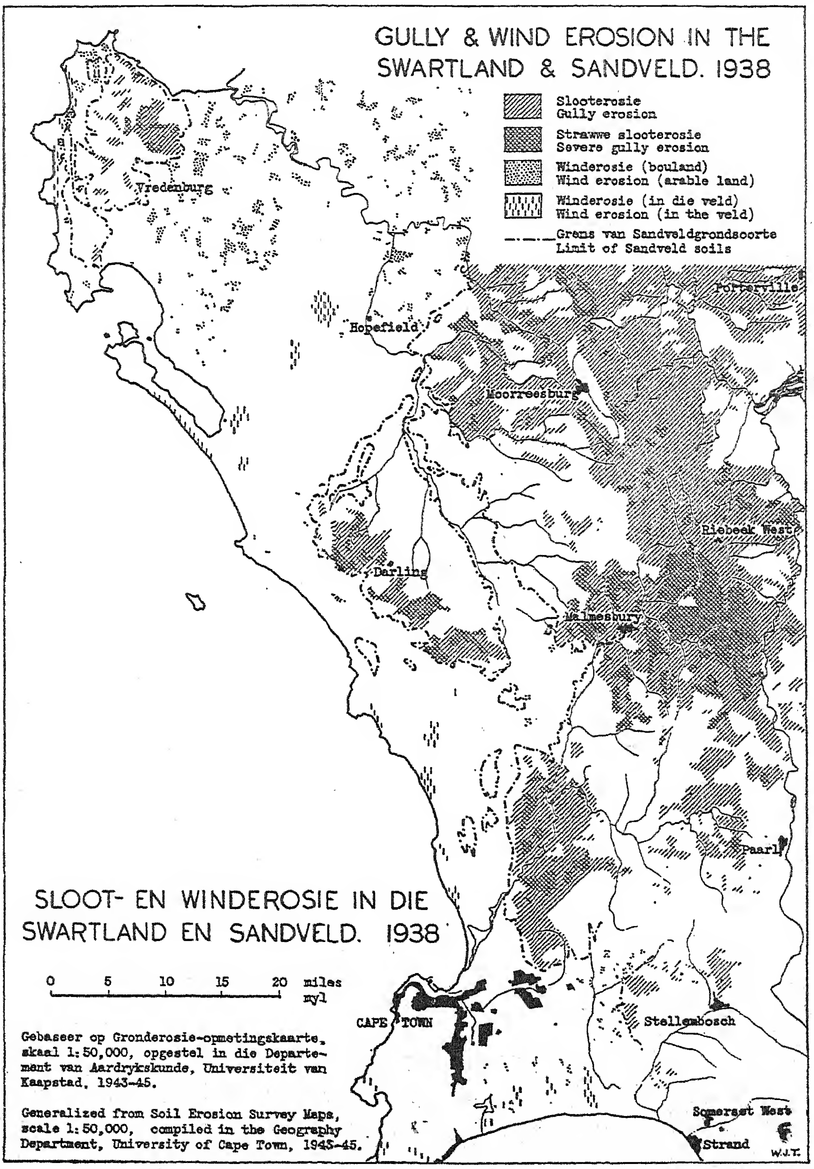
As the disease also attacks many wild grasses of cultivated lands such as guinea grass, goose grass and finger grass, it is desirable to fallow ploughed lands and cultivate them clean before sowing wheat. The common practice of flooding soils immediately after ploughing should therefore be discontinued as this promotes the growth of weeds, including grasses. It should be borne in mind that every living blade of grass helps to keep the leafhoppers alive and thus to carry the disease to the newly-sown crop.

Unfortunately the immune varieties listed in the table above are not very suitable for Transvaal conditions. It is therefore recommended that in the absence of suitable resistant varieties, early wheat be sown more thickly than usual. This should help to minimize losses.

Soil Erosion in the Swartland and Sandveld.

W. J. Talbot, Professor of Geography, University of Cape Town.

THE present bread shortage in the Union, occurring at a time when the world food crisis precludes the possibility of large imports of wheat, has focussed attention upon the deficiencies of our own wheat-growing areas. Owing to the variability of our rainfall and other weather hazards and to the generally low productivity of our soils, the average morgen yield of wheat in the



Union is low and yields in individual districts vary widely from year to year. Furthermore, this low average yield has been steadily reduced by the exploitation and deterioration of our soils over many years and by the spread and acceleration of soil erosion. This is strikingly exemplified in the western Cape Province, for long the chief wheat-producing area of the Union.

Factors Contributing to the Present Position.

With a mean rainfall of 10 to 30 inches, relatively reliable by South African standards, with upwards of 80 per cent. of the rainfall occurring during the growing season of the autumn-sown grains, and with no severe frost, the western Cape Province appears climatically better suited to wheat growing than any other important wheat-producing area in the Union. Concurrently with the development of the mining industry, the railway system, and a large urban population in the Union, wheat production in the western Cape Province increased steadily until the first World War. By 1919, in the opinion of the Departmental Committee appointed in that year to enquire into the wheat industry, the Swartland had reached its peak. Almost all the arable land was under cultivation. The long-term crop rotation formerly prevalent had been reduced to one of four years—wheat, oats, old land and fallow—and because of the large area under cultivation, the land received dressings of five to ten tons of kraal manure per morgen only at intervals of five to ten years. Under these conditions, the humus content of the soil inevitably declined, but the immediate consequences were partially masked through the increasing use of chemical fertilizers and the adoption of superior varieties of wheat which raised the low yields from an average of 4·8 bags per morgen in 1919-21 to 5·6 bags in 1927-29. Despite the relatively high production costs associated with these low yields and the increasing competition from Canadian and Australian imports, the area under wheat was maintained at the same high level, between 105,000 and 125,000 morgen, until 1930.

Thereafter, with the exclusion of effective overseas competition by the Wheat Importation Restrictions Act, wheat-growing became the best paying line in farming. The area under wheat in the Union as a whole more than doubled between 1929 and 1935. Even in the western Cape Province, where the expansion of the area under wheat had reached its apparent limit in 1919, there was an increase of 45 per cent. to over 175,000 morgen by 1934. This extraordinary expansion was made possible only by further reducing the period of rotation, by reducing the area under other crops such as oats, and by extending cultivation on to poor stoney soils and on to steep slopes, formerly regarded as uncultivable. Large areas with gradients steeper than 1 in 10 were put under the plough and in the neighbourhood of the Kasteelberg, the Koeberg and the Tygerberg farmers fearlessly extended their grain lands on to slopes steeper than 1 in 4.

On land which had been cropped so long under the four-year rotation the soil was in no heart to withstand the strain of even shorter rotations. Weed and disease problems were seriously aggravated, and the poor tilth of the soil rapidly deteriorated further. Nevertheless, disease-resistant wheat varieties, together with the stabilization of wheat prices after 1935 at levels sufficiently high to cover the costs of heavy dressings of chemical fertilizers, made it possible to combat the tendency towards declining yields for several years. However, by 1939 the chemical and

physical deterioration of the soil was so far advanced that Swartland wheat farmers were spending more on fertilizers per morgen and per bag of wheat produced than any other farmers in the Union, and were ploughing or cultivating their lands three times before sowing and often harrowing them at least once afterwards. Yet there was to be no respite for the deteriorating and eroding lands. The outbreak of war made it imperative that the Union should produce and continue to produce sufficient wheat to meet the needs of its own population and of ships provisioning in Union ports—despite the wartime curtailment of fertilizer supplies.

Survey of Erosion in the Swartland and the Sandveld.

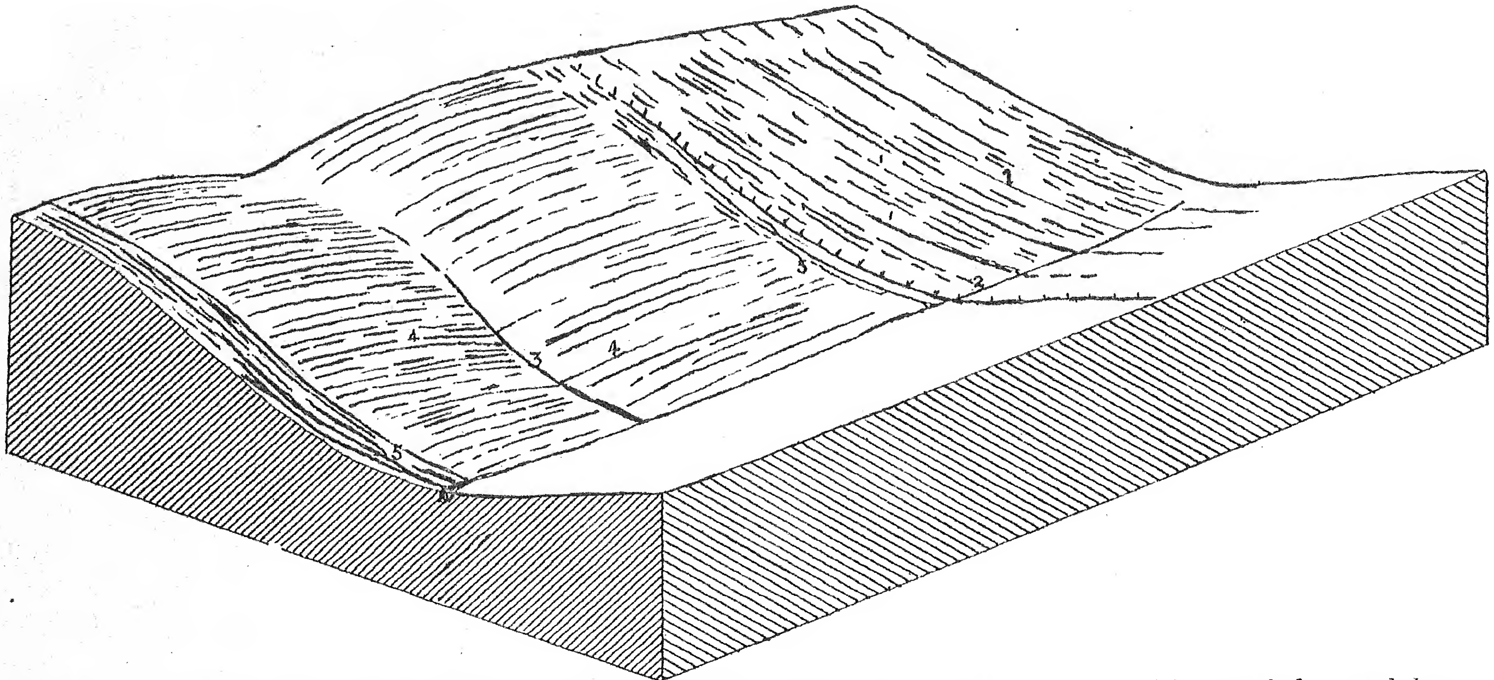
The extent to which soil erosion has affected the farm lands of this region was revealed by a detailed survey undertaken by the writer in 1943-45 on behalf of the Social and Economic Planning Council. From field observations and from air photographs taken in 1938—made available through the courtesy of Lt.-Col. Whittingdale, then Director of the Trigonometrical Survey—maps on a scale of 1·25 inches to one mile were compiled showing the location of individual gullies and of all areas of recent wind erosion.

Soil erosion is most pronounced in areas where soil characteristics and slopes are most conductive to erosion, but serious soil losses have occurred also in areas naturally less vulnerable where erosion has been encouraged by bad farming. Wind erosion is marked in the Sandveld wherever the protective vegetation has been destroyed by fire, by fuel-gathering, or by clearing and cultivation; it is especially severe where large areas have been thus denuded. Run-off erosion, practically unknown on the highly permeable Sandveld, is widespread on the loamy soils derived from rocks of the Malmesbury Series and from granites. It is especially severe on the steeper slopes of the insular mountains, e.g. on the western slopes of the Kasteelberg and, in some areas, along the sides of the young river valleys, e.g. along the Krom and Berg river valleys near Porterville. In addition, the lower sections of long slopes and the bottoms of dales under cultivation have suffered serious erosion resulting from the large columes of run-off now discharged over their unprotected surface.

Vulnerability to Erosion Aggravated.

The natural vulnerability of such areas to erosion has been generally aggravated by the prevalent methods of cultivation. Farmers without foresight, ignorant of the elementary principles of erosion, have laid out their field patterns, and have ploughed the land regardless of exposure to wind, and regardless of the direction of run-off flow and of the areas where run-off may concentrate. On most of the Sandveld grain farms areas have been devegetated and fallowed, with neither windbreaks to retard the wind nor bush strips to check the drifting sand.

On the gravelly loams of the Swartland, erosion has been promoted by the traditional rectilinear field patterns and straight furrows inherited from regions of flatter slopes and gentler rains in north-west Europe. In 1938 contour ploughing was practically unknown and is still conspicuously rare; thousands of morgen are being ploughed up- and down-slope even on gradients steeper than 1 in 10. Some fields are ploughed approximately across the slope



Block diagram illustrating how prevalent methods of ploughing induce erosion. In the field on the right, ploughed up- and downslope, every furrow becomes a watercourse during heavy rains. Rill erosion is rapid and gullies (1) soon appear. In the dale bottom where the runoff from the slopes conentrates the soil has been laid open to erosion by clearing and cultivaion; there the development of a gully (2) is inevitabe. In the field on the left, ploughed approximately across slope, the furrows slope appreciably towards the dip near the middle of the field and drain towards it during rainstorms; this concentration of runoff has caused gully erosion in the dip (3). Subsequent deepening of furrow rills has produced tributary gullies (4). In the headlands, ploughing up- and downslope has resulted in the formation of characteristic double and triple gullies (5).

but not on the contour; consequently run-off along the furrows collects in the hollows or folds in the hillsides, and overflowing furrows have there initiated innumerable gullies. The headlands of such fields are invariably ploughed up- and down-slope instead of being left uncultivated, and are consequently scarred by the "double-barrelled" gullies—in some headlands three or four of them—that are now characteristic features of the farmlands. Finally, the undulating landscape presents innumerable dales and hollows in which the run-off from adjacent slopes is naturally concentrated. Since the slopes have been cleared and cultivated, larger volumes of run-off, no longer impeded by vegetation, are discharged more rapidly than ever before into the dales, rendering the dale bottoms especially prone to erosion. Nevertheless, unthinking farmers have cleared and ploughed the dale bottoms too, with devastating results.

Highway engineers have promoted further erosion by their frequent failure to control run-off collected by roads and by discharging it into natural drainage channels without proper precautions against erosion. Too often it is heedlessly discharged on to the adjacent lands regardless of their erodibility.

Concurrently with erosion on the higher slopes, the disposition of coarse debris therefrom has seriously reduced soil fertility on lower and flatter slopes. It is notorious that run-off erosion, like wind erosion, removes most effectively the lighter and smaller particles. Where "soil" is redeposited on lower lands, only the relatively sterile sandy fraction is deposited; the finer fraction, richest in available plant foods, is carried away into the rivers and down to the sea.

Few Serious Attempts to Check the Evil.

Evidence of serious attempts to check erosion is to be seen on very few farms. Even such simple conservation practices as proper contour ploughing are conspicuously absent over most of the Swartland. Here and there a cartload of boulders tipped into the head of a gully represents an attempt to check erosion headward, but systematic gully stabilization and reclamation by check dams at frequent intervals and similar measures is practically unknown. Along many of the larger gullies small dams have been made, primarily to augment farm water supplies. These dams are most numerous in the drier north-western sections. As soil conservation measures they are of little value. Such dams at long intervals along the major gullies obviously do not retard the washing of topsoil from the surface of the lands, where the real damage is inflicted. They check the deepening of the gullies only in the few yards immediately upstream and, unless the gullies draining into them are properly stabilized and reclaimed throughout their entire length, such dams become silted up within a few years. Meanwhile they provide stock with muddy and contaminated water and, serving as temporary silt traps, they may postpone or retard the silting up of stream channels and the spoiling of lower lands by course overwashes of eroded material.

The most noteworthy erosion control works which have been undertaken, are the hillside ditches to be seen on some farms near Malmesbury and Mamre. These extend across long slopes to intercept and collect the surface run-off at intervals, leading it off into drainage channels along downslope fence lines and into

pre-existing gullies. Thereby the volume of run-off discharged over the lower slopes—and the sheet erosion associated therewith—is greatly reduced. However, the ditches are generally far too widely spaced, rarely less than 50 yards apart even on slopes of 1 in 6, so that the volume of run-off flowing over the intervening strips during heavy rains is still too great. Moreover, being dug more or less parallel to fence lines instead of almost parallel to the contours, the ditches are not properly graded. On one farm where ditches had been dug to protect cultivated land on slopes varying from 1 in 14 to 1 in 4, investigation showed the gradients along the ditches to vary irregularly from 1 in 50 to 1 in 7. Consequently the volume of water discharged by each ditch is excessive, and velocities are dangerously high. The ditches have become gullies eroded to bedrock, and in places have overflowed, thereby initiating new gullies. Furthermore, as no adequate protective measures were applied to the old gullies and natural drainage channels into which the ditches discharge, they have been rapidly eroded by the greatly increased volume of run-off now diverted into them. The fundamental idea, that of removing surplus run-off from the fields at intervals down the slopes, is sound, and in the not distant future, properly spaced and properly graded hillside ditches, supplemented by permanently grassed strips and discharging into adequately protected run-off disposal channels, may well play their part in the conservation of farmlands on moderate slopes.

Erosion Position To-day.

To-day, practically all of the cultivated land has suffered some loss of soil. Planimeter measurements of erosion survey sheets based on the 1938 air photographs show that wind erosion had then affected more than 15,000 morgen of cultivated land in the Sandveld and on the Cape Flats. At the same period gully erosion was marked over an aggregate area of more than 298,000 morgen, or approximately 987 square miles. The total area affected by wind and gully erosion was 318,000 morgen, most of which was cultivated land. Thus, approximately two-thirds of the arable land had already suffered serious soil losses by 1938 and most of the remainder had suffered some degree of sheet erosion.

Since 1938 soil erosion has continued unabated. Run-off losses and annual soil losses by wind and run-off have only increased as the soil structure has deteriorated and the depth of topsoil remaining has diminished. To-day the airman who looks down upon the grain lands of the western Cape Province, upon the gullied hillsides, wind-eroded lands and abandoned fields that are a monument to men who could stabilize wheat prices but could not stabilize the soil, can only marvel that the bread famine of to-day did not befall us years ago. It is now too late to reclaim the past. The water has gone under the bridges and the soil has been carried with it. But there is not a day to lose in stabilizing and conserving the soil that remains, and by reorganizing our farming methods, to rebuild upon surer foundations our food supplies for the future.

Rye-Bran in Poultry Rations.

P. J. Serfontein, Professional Officer (Poultry Research), College of Agriculture, Potchefstroom.

IT is remarkable that there is so little information available on the nutritive value of rye in chicken rations. The only reference which the writer could find, is quoted below, and in that report the use of rye in chicken rations is not recommended. This cereal is, however, recommended as an ingredient in the rations of full-grown birds, but even on this point there is no agreement.

In a report* of the National Research Council of Canada, the various cereals are placed in the following order:—

For growth: Oats, barley, maize, wheat and rye.

For laying and breeding: Maize, barley, wheat, oats and rye.

Halpin, Holmes and Hart of the Wisconsin Experiment Station found that rye may be profitably incorporated in mixtures for pullets and producing hens, but that it is unsuitable for feeding as grain. In an experiment in which the maize in chicken mixtures was partly replaced by rye, the change was responsible for a slowing down in the rate of growth. Pullets of more than eight weeks could digest rye more readily than young chicks. In this experiment the growth of the chicks during the first six weeks was poor. The droppings of the chicks which were fed on rye contained a sticky substance which adhered to their toes. In course of time a round ball was formed around each toe and had to be removed to enable the chicks to exercise and to eat.

German research workers refer to a toxic constituent, "Ceraline", contained in rye. In order to neutralize this undesirable constituent and make rye more digestible, "roggenstoff", made of molasses and lactic acid, is used. According to Dr. F. Fangauf and A. Haensel, rye can replace half the grain fed to laying hens, provided it is first allowed to germinate. These workers were able to replace all the cereals with rye after it had been treated with "roggenstoff". J. Jaeger obtained better results for egg production with wheat and maize than with rye, but the latter gave better results than barley. Schmidt and Lamprecht contend that feed consumption and the number and weight of eggs are slightly smaller when rye is fed. When the results are, however, calculated per unit of starch value, the production is just as good as that of the control groups. No ill effects were noticed after rye had been fed to laying hens. From the results, the conclusion is drawn that rye is not inferior to wheat in mixtures.

It is, perhaps, only in exceptional cases that rye has ever been incorporated in poultry rations in South Africa, the reason being that the production of rye has always been limited and also that, according to the available data, this cereal has not been recommended as a poultry feed. Owing to circumstances arising from international complications during the past five years, however, a byproduct of rye known as rye-bran, has appeared on the South African market. The reasons for this are the considerable increase in the population resulting from the influx from European countries of people who are accustomed to eating ryebread, and the use of rye instead of wheat to obtain a whiter loaf. The demand for ryeflour has, therefore, increased and as a result of the increased consumption of this commodity limited amounts of rye-bran have become available. It is

* Report No. 39 of 1936.

a new by product in South Africa, the nutritional value of which in poultry rations is unknown. Owing to the shortage of certain nutrients in the composition of rations, it was considered essential to determine whether rye-bran may be profitably fed to poultry and whether it has any detrimental effects on the health of chicks and laying hens. In view of the shortage of wheaten bran it was decided at the same time to ascertain to what extent wheaten bran can be replaced by rye-bran.

The rye-bran used in this experiment was bought from one of the large milling concerns. The chemical analysis of this bran as well as that of wheaten bran is indicated in Table 1.

TABLE I.—*Analysis of rye-bran and wheaten bran.*

Constituents.	Rye-bran.	Wheaten bran
	%	%
Proteins	15·65	16·00
Fibre	5·96	10·00
Fat	3·73	4·20
Moisture	11·41	10·20
Ash	3·92	5·90
Calcium	0·040	0·012
Phosphate	0·218	0·130
Manganese	40 d.p.m.	119 d.p.m.

Two experiments were carried out in which (*a*) rye-bran was fed to chicks, and (*b*) rye-bran was fed to laying hens.

Experiment with chicks.

The experiment with chicks was started on 24 May, 1944, with 225 White Leghorn chicks, divided into five groups of 50 each. From the first day up to the age of four weeks the chicks were housed in an electrical battery brooder where each group was heated individually in its compartment. During this period 1 per cent. cod-liver oil was fed, as shown in Table II. After the fourth week the chicks were transferred to chicken houses (10 ft. by 12 ft.) with cement runs. No artificial heat was applied in these houses, nor were the chicks given green feed. The chicks were weighed individually every two weeks. The rations fed are shown in Table II.

TABLE II.—*Rations fed from first day up to the age of* 10 *weeks.*

Ingredients.	Groups.				
	1.	2.	3.	4.	5.
	lb.	lb.	lb.	lb.	lb.
Yellow mealiemeal	44½	44½	44½	44½	44½
Oatmeal	10	10	10	10	10
Lucerne meal	8	8	8	8	8
Wheaten bran	20	15	10	5	—
Rye-bran	—	5	10	15	20
White fishmeal	15½	15½	15½	15½	15¼
Bonemeal	—	—	—	¼	¾
Powdered oyster-shell	1½	1½	1½	1½	1
Salt	½	½	½	½	½
Manganese sulphate	½ oz.	½ oz.	½ oz.	½ oz.	½ oz.
	100	100	100	100	100

Calculations from the above data showed no significant difference between the groups.

TABLE III.—*Calculated composition of the ration.*

Constituents.	Groups.				
	1.	2.	3.	4.	5.
	%	%	%	%	%
Crude proteins..............	19·58	19·57	19·56	19·59	19·56
Calcium.....................	1·56	1·56	1·55	1·60	1·52
Phosphorus..................	0·94	0·89	0·84	0·81	0·81
Crude fibre.................	5·66	5·47	5·30	5·11	4·95

The chicks were examined weekly for symptoms of nutritional deficiencies. Chicks which died during the first week, were replaced by spare chicks from the same brood. Deaths which occurred during the first week, were not regarded as attributable to the ration fed. Further, regular observations were made of feather growth, feather eating and cannibalism.

TABLE IV.—*Average weight and feed consumption per chick at the ages of 4 and 8 weeks respectively.*

Groups.	Fourth Week.			Eighth Week.			Feed required.
	Cockerels	Pullets	Feed consumption	Cockerels	Pullets	Feed consumption	To produce 1 lb. live weight at 8 weeks
	lb.	lb.	lb.	lb.	lb.	lb.	lb.
1........	0·60	0·52	1·19	1·74	1·42	4·77	1·58
2........	0·62	0·57	1·31	1·82	1·52	5·01	1·64
3........	0·62	0·56	1·29	1·80	1·46	4·87	1·61
4........	0·58	0·52	1·21	1·67	1·43	4·85	1·56
5........	0·54	0·47	1·19	1·68	1·42	4·80	1·53

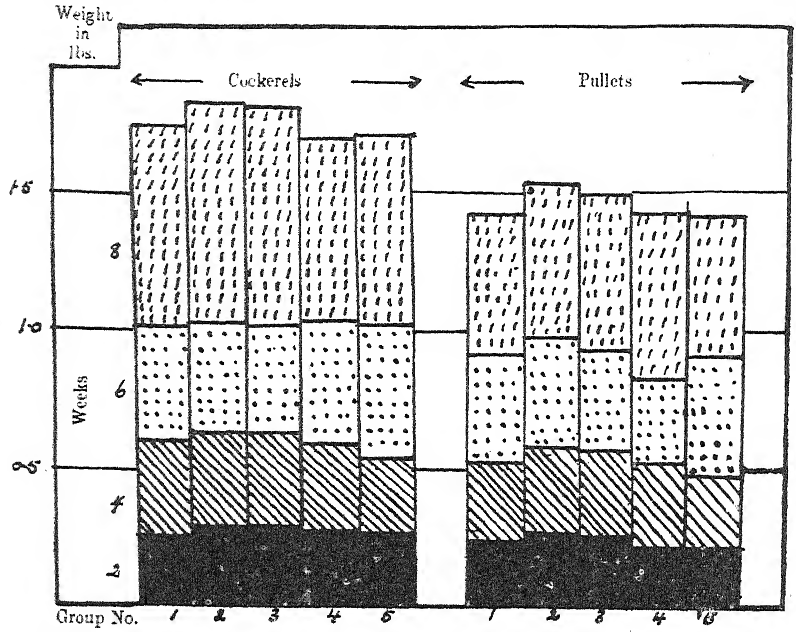
Up to the age of 8 weeks, no deaths had occurred in any of the groups.

TABLE V.—*Percentage of chicks showing nutritional deficiencies.*

Group.	Flavin deficiency	Pantothenic acid deficiency.	Perosis.	Cannibalism.
	%	%	%	%
1............	4·44	—	—	—
2............	2·22	—	4·44	2·22
3............	—	—	—	4·44
4............	2·22	—	—	—
5............	—	—	—	—

Results of Experiment.

The results obtained with rye-bran in chicken rations were good beyond expectation. As mentioned above, the object was to determine whether rye-bran can be used in chicken rations and whether it can replace wheaten bran either partly or completely. According to the results obtained in this experiment, this byproduct of rye can be included to advantage in chicken rations and can be partially or completely substituted for wheaten bran. According to Table II, as much as 20 per cent. of rye-bran was included and equal quantities of wheaten bran were replaced by this ingredient. The weights, as indicated in Table IV, are very satisfactory for all groups. A statistical analysis of the results showed that there is no significant difference between the groups.



Average two weekly weights and increase in weight on rye-bran in chicken rations.

No detrimental effects were noticed following the feeding of rye-bran, which is in accordance with the data in the publications quoted dealing with rye as an ingredient in poultry rations. The droppings showed a tendency to adhere to the chickens' toes. In all groups the chicks were exceptionally well feathered and they appeared to be very clean and healthy. The amount of feed required to produce one pound weight, as indicated in Table IV, was practically the same in all groups.

From Table V it will be observed that there were cases of flavin deficiency in Groups 1, 2 and 4. According to the data, fishmeal and lucerne meal are reasonably good sources of this vitamin, but like most of the available types of lucerne meal, the lucerne meal which had to be used in this experiment was of an extremely poor quality. The flavin content of the lucerne meal must, therefore, have been low, which would account for the cases of flavin deficiency.

Two cases of perosis occurred in Group 2. According to Table I, the manganese content of rye-bran is nearly a third of that of wheaten bran. If the occurrence of this nutritional deficiency was caused solely by a deficiency of manganese, more cases should have occurred in Group 5 where wheaten bran was replaced by rye bran. The choline content (a deficiency of which is partly responsible for perosis) of rye-bran, is not known. It is noteworthy that no cases of dermatosis due to a deficiency of pantothenic acid, occurred.

As has already been mentioned, there were no deaths. The cases of cannibalism shown under Groups 2 and 3 in Table V occurred in the form of toe-picking. The chicks were fed on these rations up to the age of 10 weeks. At this age the chicks in all the groups were a picture of health in every respect. They were also exceptionally well feathered.

Experiment with laying hens.

The experiment with rye-bran in laying rations was started on 1 April, 1944, and extended over a period of 10 months. The Black Australorp hens used were already in production when they were placed in individual batteries used for this purpose. Five groups were made up, the first three of which consisted of 40 hens each, and the last two of 36 each.

The hens were weighed every two months and separate records were kept for each hen. All hens that died were examined and records were also kept of all the abnormalities they exhibited. The

TABLE VI.—*Ingredients of ration.*

Ingredients.	Groups.				
	1.	2.	3.	4.	5.
	lb.	lb.	lb.	lb.	lb.
Yellow mealie meal	33½	33¼	33	33	33¼
Oatmeal	10	10	10	10	10
Lucerne meal	8	8	8	8	8
Wheaten bran	20	15	10	5	—
Rye-bran	—	5	10	15	20
White fishmeal	18¼	18½	18½	18½	18¼
Bonemeal	5	5	5¼	5½	5¾
Powdered oyster-shell	4¾	4¾	4¾	4½	4¼
Salt	½	½	½	½	½
Manganese sulphate	½ oz.	½ oz.	½ oz.	½ oz.	½ oz
Mash	100	100	100	100	100
Yellow maize grain	100	100	100	100	100

TABLE VII.—*Constituents of equal portions of mixture and grain as calculated.*

Constituents.	Groups.				
	1.	2.	3.	4.	5.
	%	%	%	%	%
Crude fibre	3·83	3·74	3·65	3·56	3·48
Crude protein	15·46	15·53	15·54	15·57	15·53
Calcium	2·06	2·06	2·08	2·07	2·04
Phosphorus	0·91	0·90	0·90	0·90	0·90

chemical composition of the rye-bran used in this experiment is the same as that shown in Table I.

The rations which were fed, are given in Table VI.

Crushed maize was fed in the afternoon, strewn over the mixture in the hoppers. Green feed was fed once a day in the middle of the day and consisted of lucerne, wheat or oats, according to the time of year. A quarter of an ounce of oyster-shell was placed in the hopper of each hen weekly. The mixture was fed daily in small quantities so that the hens could just clear the hopper every day. Consequently wastage was minimized since the feed could not be scratched out of the hoppers.

TABLE VIII.—*Average bodyweight.*

Month.	Average weight of hens.				
	1.	2.	3.	4.	5.
	lb.	lb.	lb.	lb.	lb.
April 1 (1944).............	5·26	5·36	5·21	5·25	5·13
June 1..................	6·15	6·24	6·17	6·23	6·03
August 1.................	6·35	6·55	6·40	6·49	6·28
October 1.................	5·95	6·19	6·00	6·04	5·92
December 1...............	5·81	5·74	5·63	5·75	5·69
January 31 (1945)..........	5·28	5·49	5·35	5·29	5·22

TABLE IV.—*Average monthly production and total egg production of hens.*

Month.	Groups.				
	1.	2.	3.	4.	5.
1944 April.................	6·40	7·60	5·00	5·70	8·4
,, May...................	12·90	10·60	10·60	10·30	13·00
,, June.................	16·00	13·30	13·30	11·90	11·00
,, July.................	13·90	13·90	13·90	11·90	9·90
,, August...............	13·50	12·50	11·50	10·50	10·60
,, September...........	15·10	15·30	14·40	14·00	13·90
,, October.............	15·20	13·70	12·80	12·40	13·30
,, November...........	15·07	13·20	12·20	11·40	11·90
,, December............	11·60	11·5	8·20	9·20	8·70
1945 January..............	12·90	9·30	7·20	5·20	8·30
Average total..............	139·4	121·7	113·30	101·3	105·5
Weight per 100 eggs in grammes	5965	6109	6320	6036	6469

Results of the Experiment.

The results in Table IX were analysed statistically. At the end of the experiment in January, Group 1 was better than Groups 3, 4 and 5. According to Table VI, 20 per cent. wheaten bran was included in the ration fed to Group 1, while 5, 10, 15 and 20 per cent. of the wheaten bran was replaced by rye-bran in Groups 2, 3, 4 and

5 respectively. The inclusion of five per cent. rye-bran in the laying rations in this experiment did not affect the results in any way. There were no significant differences between the number of deaths in the various groups.

Rye-bran, therefore, had no detrimental effect on the health of the hens. Even the palatability of the various mixtures was not

TABLE X.—*Average total feed consumption.*

Month.	Groups.				
	1.	2.	3.	4.	5
	lb.	lb.	lb.	lb.	lb.
1944 April	6·98	7·17	7·21	7·72	7·91
,, May	14·47	14·67	14·77	15·36	16·08
,, June	22·13	21·91	21·86	23·05	23·77
,, July	29·60	29·20	29·40	30·30	31·03
,, August	33·70	33·21	33·07	33·54	34·52
,, September	42·66	41·40	42·36	42·17	43·30
,, October	46·16	45·50	45·68	45·63	46·12
,, November	53·05	50·23	51·41	51·43	52·58
,, December	59·08	56·00	56·51	58·51	58·19
1945 January	66·87	63·93	64·59	66·80	69·25

TABLE XI.—*Percentage mortality in the various groups.*

Group.	Cancer cases.	Other causes.	Total.
	%	%	%
1	7·5	7·5	15
2	2·5	10·0	12·5
3	2·5	10·0	12·5
4	—	5·5	5·5
5	8·0	2·7	10·7

affected by the rye-bran, judging from the feed consumption, as indicated in Table X.

The cod-liver oil used in this experiment was of doubtful quality. If the experiment could be repeated with a more reliable cod-liver oil, the results might be more favourable for rye-bran in the case of laying rations than was the case in this experiment.

Conclusions.

(1) Rye-bran yields excellent results in chicken mixtures and as much as 20 per cent. can be incorporated in these mixtures.

(2) According to the results of this experiment, five per cent. of the wheaten bran in laying rations can be replaced by rye-bran.

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The Verandah Trellis.

A. H. Malan, Western Province Fruit Research Station, Stellenbosch.

IN choosing the most suitable trellising system for table-grape vines in a specified area, the following factors should be considered: soil, locality, intensity of the wind, irrigation facilities, variety of grape, etc.

The trellising systems already developed include the following: The Perold system, the Italian fish spine system, the verandah or slanting trellis and the overhead trellis. All of these may be recommended depending on the factors already mentioned.

In this article, it is not proposed, however, to consider the advantages and disadvantages of different trellising systems, even under conditions which are equally favourable, but only to give a detailed description in so far as this is possible, of the construction of the verandah or slanting trellis and to outline the advantages and disadvantages of this particular type of trellising.

FIG. 1.—Verandah (slanting) trellis on the experiment Farm, Bien Donne, Great Drakenstein, of the Western Province Research Station. In this case the arms of the cross-bar are equal on either side of the upright post.

Method of Construction.

In this trellising system the vine rows may, for example, be 10 ft. apart and the vines in the rows 6 ft. apart. Although the direction of the trellis is often determined by the lie of the land, the direction recommended is, south-east north-west, where possible, with the " verandahs " facing north-east. The trellises then lie in the direction of the south-east wind and the bunches can swing fairly freely and are, at the same time, exposed to the beneficial rays of the rising sun.

As shown in Figs. 1 and 2 the verandah trellis consists of vertical or upright poles to the upper end of which slanting poles, with a number of wires strained at equal distances, have been attached by means of bolts. Although the details of construction may sometimes vary, the principle remains the same.

Poles.—The corner posts are very important and should be strong. Light rails are excellent for the purpose, but wooden posts 4 to 5 in. in diameter, treated with creosote to prevent early rotting, are equally effective. These poles must be firmly secured to concrete blocks or other fixed objects. The posts are 8 ft. long and planted into the soil to a depth of 3 ft. The inside or line standards are also 7 to 8 ft. long (standard length) with a diameter of 2 to 3 in. They are planted neatly in line, about 24 ft. apart and at a depth of 2 to 3 ft. leaving a length of 5 ft. projecting above the soil surface.

In irrigated soil a fairly large flat stone may be placed under each standard to serve as a firm foundation, since the weight of a heavy crop may cause the line standards to sink in when the soil is very damp. The slanting poles, 5 ft. in length, are bolted to the vertical poles about 3 in. from the top, after the necessary pieces have been sawn out from the sides in order to make a firmer join. At the corner posts, slanting poles of 3 to 4 in. thickness are used, whereas the slanting inside standards may have a diameter of 2 to 3 in. (Here too, only treated wooden standards should be used. These are obtainable from the Department of Forestry.)

The slanting poles are placed with the highest point 6 ft. from the soil surface and 3 ft. from the vertical pole and the lower end 2 ft. from the vertical pole and 4 ft. 4 in. from the soil surface [BE 6 ft.; BA 3 ft.; AD 2 ft.; and DK 4 ft. 4 in. (see Fig. 2)]. This will form an angle of about 25° with the soil surface.

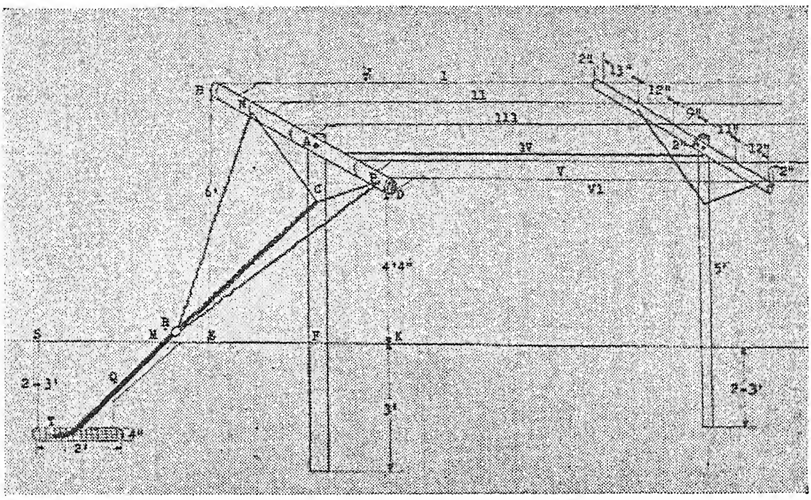

FIG. 2.—BA 3′; DA 2′; BE 6′; DK 4′4″; NA 1′9″; AP 1′9″; CF 3′6″; FM 3′6″; MS 2′9″.
RC. 4-strand No. 8 wire; RN, RP two-strand No. 8 wire; CN CP, single No. 13 wire; Q iron; T stay blocks of reinforced concrete.

Use bolts (with washers) about 6 in. long and $\frac{3}{4}$ in. thick for the corner posts and 4 in. long and $\frac{3}{8}$ in. thick for the inside standards.

The Stays.—It is essential that the corner standards should be securely stayed before the wire is strained. Reinforced concrete blocks of 2 ft. by 2 ft. by 4 in. are suitable for the purpose. These blocks are embedded at a depth of about 2 ft to 3 ft., depending on the soil type.

The measurements of the stay as well as the depth may vary according to the length of the trellis plot. The concrete block may be cast direct in a hole dug in the soil, with a mixture consisting of one part cement, two parts sand and four parts broken stone of 1 in. diameter. Into the concrete block which is reinforced with wire, an iron rod is secured by bending it at the bottom. The wire stays are attached to the top of this rod which should protrude a few inches

above the soil surface. This will prevent the wires from coming into contact with the ground and eventually corroding.

The distance from the top of the iron rod to the pole to which the wire stays are attached, is about 3 ft. 6 in. Three wire stays will be required. Four strands of No. 8 wire intertwined, are attached to the vertical pole. The hole for this is drilled 3 ft. 6 in. above the soil surface. Two strands of No. 8 wire intertwined, are attached to the slanting pole, at a distance of say 15 in. from the top and 3 in. from the lower end, or both 1 ft. 9 in. from point A (see Fig. 2). From these points N and P on the slanting poles, light wires are strained to points C on the vertical poles. This will help to keep the slanting poles firmly in position.

The Wiring System.

When the poles are in position and firmly stayed, the wires may be strained. Wire No. IV (Fig. 2), serves to support the stem and bearers and is a No. 10 smooth galvanized wire. This wire is strained 2 in. to 3 in. lower than point A on the slanting pole and is drawn through ¼ in. holes in the line standards.

The other five wires are smooth No. 13 wires and are strained parallel on a slanting plane. The two outside wires, Nos. I and VI, are each strained two inches from the ends of the slanting poles. The inside wires are strained at different distances apart as shown in Fig. 2, i.e. wire No. II, 13 in. from No. I; No. III, 12 in. from No. II; and No. V, 11 in. from No. VI. Wires Nos. III and V will, therefore be 9 in. and 11 in. from point A on the slanting pole, respectively.

The wires are kept in position by notches sawn in the slanting poles into which they are clamped.

Time of Trellising.—As in the case of other trellises, posts and stays should, as far as possible, be planted early in winter, to enable them to become firmly entrenched during the rainy season. Strain the wires in spring when the expansion is not abnormal and the soil has settled.

Advantages of the Verandah Trellis.

(1) Space is provided for better growth of the vine above the soil and, consequently, the balance between this development and the development of the root system is improved. In this way better fertilization and the improvement of fertility in the vine are also made possible.

(2) This trellising system eliminates the malpractices of twisting or entwining the suckers on the wires, as a result of which clusters of young bunches and leaves are formed, and of too heavy topping of the suckers with the topper, or even a sickle.

(3) Cultivation practices such as pruning, ploughing, tipping of suckers, pre-thinning, winter spraying and sulphuring are considerably facilitated.

(4) Since the bunches hang fairly freely under the leafy roof, bruising and scorching are obviated. They are also clearly visible and easily accessible—an important consideration when harvesting the crop.

(5) This type of trellis allows of free movement from one row to the next, and consequently supervision of labour is facilitated.

(6) This system is eminently suitable for grapes of medium vigour such as Hanepoot and Alphonse Lavelée and in cases where timely and thorough tipping (removing of extreme tips of growth) of suckers may considerably improve the weight and quality of the crop.

(7) In areas exposed to strong winds the young shoots may be tied to wires Nos. III and V and then intertwined with wires III, II, I and V and VI (see Fig. 2).

(8) By the use of slanting "verandahs" the fruit is exposed to the sun and colouring improved. This is an important consideration in the case of a variety such as Barlinka which, under certain conditions does not develop sufficient colour. The bunches also dry more quickly after rain—a big advantage indeed in vines in the summer-rainfall area.

(9) Adequate provision is made for the circulation of air, a valuable control measure against fungus diseases such as powdery mildew.

(10) The verandah trellis may be recommended on medium fertile soils, even under irrigation. Untopped or tipped shoots rest on the wires, forming a wide roof of leaves, which protects the grapes against damage by scorching.

(11) In spite of this roof, it is possible to plough right up to the stem and consequently fewer ridges have to be dug.

(12) Large crops can be obtained from this type of trellis which enables the vines to develop strongly and vigorously.

Disadvantages of the Verandah Trellis.

(1) The costs involved in the construction of this type of trellis seem to be high—especially with the present prices of the necessary materials. This disadvantage is, however, more than compensated for by the many advantages offered by this trellis over a long period.

(2) Ploughing lengthwise as well as crosswise as in the case of the overhead trellis is impossible. For this reason the ridges have to be dug out by hand.

Construction costs of a verandah trellis covering a square piece of land, one morgen in extent.

	£ s. d.	£ s. d.
POLES.		
62, 4–5 inch treated wooden poles 8′ long @ 4s. 1d. each.......	12 13 2	
62, 3–4 inch treated wooden poles 5′ long at 150s. per 100......	4 13 0	
372, 2–3 inch treated wooden poles 8′ long @ 139s. 7d. per 100	25 19 3	
372, 2–3 inch treated wooden poles 5′ long @ 79s. 2d. per 100.	14 16 6	
TOTAL, POLES..............................		58 1 11
STAYS.		
62, iron stays, length 3′, diameter ½″.......................	0 15 0	
15 pockets cement (94 lb. per bag) @ 2s. per bag............	1 10 0	
1⅗ cub. yds. broken stone, 1 inch in diameter @ 7s. 6d. per cub. yd...	12 0	
⅚ cub. yds. sand @ 4s. 6d. per cub. yd....................	3 10	
TOTAL, STAYS..............................		3 1 8
WIRE.		
10 rolls galvanized wire No. 12 × 14 (about 1,600 yds per roll of 100 lb.) @ £2. per roll..................................	20 0 0	
4 rolls galvanized wire No. 10 (about 762 yds. per roll of 100 lb.) 42s. per roll..	8 8 0	
2 rolls galvanized wire No. 8 (about 488 yds per roll of 100 lb.) @ % 40s. per roll..................................	4 0 0	
TOTAL, WIRE..............................		32 8 0
62, 6″ × ⅜″ bolts with nuts and washers....................	0 14 2	
372, 4″ × ⅜″ bolts with nuts and washers..................	3 10 0	
TOTAL, BOLTS COMPLETE..............................		4 4 2
Labour (unskilled)..............................	7 10 0	
TOTAL, UNSKILLED LABOUR..............................		7 10 0
TOTAL, COSTS (TRANSPORT COSTS EXCLUDED)......		£105 5 9

Construction Costs of the Verandah Trellis.

The costs will vary according to the length of the rows, the materials used and the hardness of the soil. Longer rows are more economical since fewer corner posts and stays are required.

Calculated at the present prices, the costs of one morgen under a slanting trellis with rows 10 ft. apart, is as shown in the table.

Owing to the prevailing prices of treated poles (obtainable from the Department of Forestry) and the high price of wire, especially, the costs involved in the construction of the trellis are high at the moment. A fall in prices will bring a corresponding decrease in the costs.

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Levelling Outfits for Farmers.

IN order that farmers may help themselves in the surveying of anti-erosion works, the Director of Soil Conservation and Extension has made arrangements for the local manufacture and sale of reliable, but cheap instruments. The outfit consists of a telescopic dumpy level with tripod, levelling staff and instructions. It will be obtainable from the Division of Soil Conservation and Extension, P.O. Box 965, Pretoria, against a remittance of £10, accompanied by a certificate from the local Magistrate or Extension Officer, indicating that the applicant is a *bona fide* farmer.

New Bulletins.

The following Bulletins have recently been published:—

Bulletin No. 249, Winter Pruning and Trellising of Vines, Price 3d.

Bulletin No. 259, The Engineering Problems in Soil Erosion Control, Price 6d.

Suicidal Farming versus Strip Cropping (Free).

Bulletin No. 264, Turkeys, Price 3d.

Obtainable from the Editor of Publications, Department of Agriculture, Pretoria.

Amounts of more than sixpence must be sent in the form of postal orders, cheques, etc.

The Farm Home.

(A section devoted mainly to the interests of Farm Women.)

Cleaning Household Articles.

Miss Erica Teichmann, Home Economics Officer, Department of Agriculture.

SHAMPOOING upholstered furniture by the dry suds method is not too professional a job for any amateur. So why not tackle the task yourself?

Before commencing, examine the material. Washable glazed chintz, rep, denim frieze, and tapestry can all be shampooed with success, but velvet or velour should never be attempted, mohair being the only pile fabric than can be cleaned at home.

Make sure that the material is colour fast. To test this, dip a clean white cloth in lukewarm water and put the moistened cloth on an inconspicuous spot on the back of the chair. If there is the slightest trace of colour on it, you will be wise to turn it over to a professional to slipcover it or to use a dry cleaner.

Any article to be cleaned must be free from dust. Remove all the dust with a vacuum cleaner, and if this is not available, use a whisk broom or a brush.

Now proceed to mix the shampoo, bearing in mind that it is vital not to soak the filling. Consequently, the shampoo must be as dry as possible. Use dry soap flakes and mix it into a jelly, using ½ cup of flakes to 5 cups of water. Heat until it has dissolved and allow to cool. You will then have a semi-firm mass resembling gelatine, and this must be whipped to a lather-like consistency before being used. An egg beater is suitable for this purpose.

Apart from the shampoo, you will also need 2 bowls of clean lukewarm water, a spatula, ruler or large knife, a supply of clean cloths, and a fibre scrubbing brush. Collect all these and then commence the job.

Dip the brush into the suds and apply with a circular motion to a small area on the chair. As soon as the suds are dirty, scrape them off with a spatula or similar tool. If the spot is not yet to your satisfaction repeat the process. Remember, however, not to cover too large an area at one time. Now for the rinsing, which must be done very carefully as you must not wet the filling. Dip a clean cloth in lukewarm water and wring it out until it is barely moist. Go over the cleaned place with the moistened cloth, with a gentle circular motion. Repeat this process with a clean cloth to ensure the complete removal of soap. It is essential to change the rinsing water and cloth as soon as they show dirt.

Repeat the process, overlapping the part already cleaned each time, so that no ugly rings show. To ensure quick drying, place the furniture in a draught, not in the sun.

To revive the colours, dilute a little vinegar and rub the surface with it.

Furniture upholstered with a material with a pile is treated quite differently. To clean these, use hot bran. Again remove all

the dust, and rub the hot bran into the upholstery. Cover it up with an old cloth and leave overnight. Shake out thoroughly the following morning and give it a thorough brushing.

If there are any soiled spots on the chair, e.g. oil or greasiness, remove them first with benzine.

To clean carpets.—Remove all dust and then use the same shampoo as for cleaning upholstered furniture, but add 1 t. of ammonia. The method employed is exactly the same. It is essential to keep the carpet as dry as possible as moisture weakens the backing. Wen it is dry, the colours can be freshened up by rubbing the whole carpet lightly with a solution of vinegar and water.

To clean aluminium.—Aluminium utensils and vessels should be cleaned with a solution of hot suds and ammonia. On no account must soda be used for cleaning aluminium ware.

To clean blankets.—Dissolve 2 large tablespoons of borax in a pint of soft water, and, when dissolved, add the solution to the warm, soapy water in which the blankets have to be soaked. Put one blanket in at a time, and let it soak for a short while. Then move it about in the water, squeezing it between the hands. When it is clean, rinse thoroughly, and hang it up to dry. Do not wring the blankets, but shake them occasionally until dry.

To remove stains from brown boots.—Cut a piece of lemon and rub it well on to the boots; then polish with brown polish. A banana skin also acts as a good polish for brown boots.

To clean chamois leather.—Chamois leather which is very much soiled, should be soaked in a pint of soapy water to which 3 t. of household ammonia have been added. The leather should then be worked with a spoon, so as to press out the dirt as much as possible. Rinse in tepid water, rub well, and rinse several times again in fresh water. Hang out in the shade to dry, and pull frequently to keep it soft.

To clean eiderdown quilts.—Prepare a solution of warm water and soft soap, and plunge the quilt into this. Squeeze with the hands till the water becomes dirty, then place in fresh suds and repeat the process. Rinse well in as many changes of water as are necessary to get rid of the soap. Squeeze out the water and hang the quilt up to dry. When dry, shake it till it is quite soft and full, or the down will become lumpy.

To clean furs.—White furs may be cleaned with fuller's earth or dry magnesia. Sprinkle it over, and carefully work it into the fur with a clean linen cloth. Leave the fur undisturbed for an hour, then shake it out and brush it with a perfectly soft clean brush. For dark furs, heat some bran in the oven (it must not be too hot, or it may permanently damage the fur), rub the fur with it, and shake it well afterwards to remove all traces of bran.

Leather reviver.—Mix $\frac{1}{3}$ of a pint of vinegar with $\frac{2}{3}$ pint of boiled linseed oil, and shake in a bottle to the consistency of cream. Rub a little of this into the leather and polish with a soft cloth.

Cleaning linoleum.—Never use soap, if possible, when cleaning linoleum. Also avoid ammonia and all soap powders. These cause the colours to fade and break up the paint. Take a clean cloth, and apply clean, lukewarm water; rinse well and dry thoroughly with a clean, soft rag. When the linoleum is dry, apply a very little warm linseed oil. This will give a fine gloss.

Polished tables.—Marks on polished tables due to hot plates can be removed by applying paraffin, rubbing it in well, and polishing with a soft cloth. The treatment must be repeated for several days.

Velvet collars.—Velvet collars on coats are apt to become rubbed and shiny. This can easily be remedied by means of a cloth dipped in ammonia. Hold the collar over a hot iron immediately afterwards in order to raise the pile.

Crops and Markets

A Statistical and Economic Review of South African Agriculture

by

The Division of Economics and Markets

Volume 26 JANUARY 1947 No. 293

CONTENTS

Price Review for November 1946.*

Fruit.—Moderate consignments of early peaches, apricots and cherries came on the markets and experienced a strong demand. Supplies of citrus fruit decreased remarkably. Of the tropical fruits only papaws and granadillas were offered in reasonable quantities.

Tomatoes.—Supplies of tomatoes decreased on most markets, except on the Johannesburg and Durban markets which were well supplied. Tomatoes of good quality, however, throughout realised high prices.

Onions.—Larger quantities of onions, especially Transvaal onions, reached the markets and consequently prices on the Johannesburg market declined from 24s. 9d. to 21s. 11d. per bag and on the Durban Market locally produced onions from 32s. 3d. to 24s. 8d. per bag.

Potatoes.—Larger quantities of potatoes came on the markets than the previous month and prices decreased. Moderate consignments of sweet potatoes were sold throughout at satisfactory prices.

Vegetables.—In general supplies were very moderate and prices increased generally, except in the case of green beans which were fairly plentiful.

Seeds, Grains and Feeds.—Teff, oats and especially lucerne were offered in great quantities on the Johannesburg market, while moderate quantities of sweet grass and green lucerne were disposed of satisfactorily.

Eggs and Poultry.—The supply of eggs showed a decrease on most markets except on the Durban market which was well supplied. The limited supplies on the poultry market experienced a strong demand.

* All prices mentioned are averages.

Index of Prices of Field Crops and Pastoral Products.

THIS index, appearing elsewhere in this issue, increased from 201 the previous month, to 203 in November 1946.

The most important changes occurred in the following cases:—

(*a*) Prices of winter cereals such as wheat, oats, rye and barley were increased as from 1 November for the present season. (See *Crops and Markets* of December 1946 for more details.)

(*b*) "Other field crop products", i.e. potatoes, onions, sweet-potatoes and dry beans decreased from 365 the previous month to 309 as a result of price decreases in the case of potatoes, onions and sweet-potatoes.

(*c*) Dairy products decreased from 231 to 194 as a result of the cessation of the payment of winter premiums on butterfat and cheese milk and the seasonal decrease in the price of condensing milk. (See *Crops and Markets* of December 1946 in this connection).

(*d*) Pastoral products increased from 171 to 179 in November, due to further increases in the prices of wool, hides and skins.

(*e*) Slaughter cattle increased from 202 to 206 as a result of a further rise in seasonal prices of slaughter cattle.

(*f*) "Poultry and poultry products" increased from 155 to 171 in November because of the sharp increase in prices of eggs which took effect from the beginning of November.

Maximum Prices of Farm Feeds.

THE maxiumm prices of all registered farm feeds, farm feed mixtures and any locally produced animal or vegetable protein feeds, as well as of carcase meal, meat meal, blood meal or fish meal, were previously frozen at the June 1946 rates thereof, according to Government Notice No. 1802 of 23rd August 1946.

In the case of balanced rations containing imported protein materials, manufacturers received a subsidy of £2 15s. per ton. The subsidy has, however, been withdrawn as from 1 December 1946, and from that date prices of such balanced rations may therefore be increased by £2 15s., while for the rest prices still remain frozen at the June 1946 rates.

(See *Government Gazette Extraordinary* of 29 November 1946.)

Review of the Wool Market during November 1946.

DURING November 1946 a total of 127,857 bales of wool was offered for sale in Union ports, of which 99,588 bales (78 per cent.) were sold.

Fairly large quantities of short wools were offered, but quantities of spinning wools were moderate.

The demand for good quality wool was strong, but inferior types attracted little competition. Values in general tended to weaken towards the end of the month.

Agricultural Conditions in the Union during November, 1946.

Rainfall.—Scattered showers again occurred throughout the country and brought relief, particularly on the highveld and northern Transvaal.

Pastures.—The widespread occurrence of showers of rain caused the pastures to improve, but good precipitations were, however, necessary to promote rapid growth.

Stock.—The condition of stock was generally fair, especially in parts where rain occurred, but began to deteriorate in certain districts of the western and eastern Orange Free State, while in the north-western Cape Province the continual drought caused cattle losses. Lumpy skin disease was still incident in the western and south-western Cape Province, but other stock diseases were quiet.

Crops.—Generally prospects for wheat were promising and although hail caused damage in certain parts in the western and eastern Orange Free State and the Karroo, good harvests were nevertheless generally expected. Summer cereal crops were also promising, but were dependent on later falls of rain. In certain parts of Natal and Transvaal farmers were still busy ploughing and planting for summer cereals. In Natal the sugar cane has shown a rapid improvement after the rain, although an irrecoverable blow was suffered as a result of the earlier prolonged drought.

Maximum Prices of Eggs.

THE maximum wholesale and retail prices of eggs in controlled areas as fixed on 25 October 1946 (see *Crops and Markets* of December 1946), have been increased all round by a further 4d. per dozen for each grade as from 29 November 1946 and again by 4d. per dozen as from 13 December 1946. Prices are now as follows:—

	Maximum Price per Dozen. Wholesale.		*Retail.*	
	s.	d.	s.	d.
Grade I.				
(*a*) Extra large	2	9	3	0
(*b*) Large	2	7	2	10
(*c*) Medium	2	5	2	8
(*d*) Small	2	3	2	6
Grade II.				
(*a*) Large	2	5	2	8
(*b*) Medium	2	3	3	6
(*c*) Small	2	1	2	4
Grade III.				
Mixed	2	2	2	2

(See *Government Gazette Extraordinary* of 13 December 1940.)

The maximum wholesale and retail prices of chilled eggs in the Union as fixed on 22 February 1946 have been discontinued as from 15 November 1946 (see *Government Gazette Extraordinary* of 15 November 1946).

Maximum Prices of Potatoes.

As the marketing season for winter potatoes has ended, the maximum prices of potatoes in the controlled areas as fixed on 16 August 1946, were reduced as follows as from 22 November 1946:—

In the case of potatoes sold direct by a producer to a trader, the maximum prices are 31s., 30s., 26s. 6d. and 22s. per bag (150 lb.) free-on-rail for first grade sized, first grade unsized, second and third grade, respectively.

When the sales take place by auction or otherwise on behalf of the producer by an auctioneer, a market agent, broker or other agent, the maximum prices are 31s. 9d., 30s. 9d., 27s. 3d. and 22s. 9d. per bag respectively, including commission. Railage may, however, be added to these prices.

In the case of potatoes sold on behalf of a producer by a market agent the maximum prices are 33s. 6d., 32s. 6d., 29s. and 24s. 3d. per bag respectively, including railage, commission, transport and other market charges.

For potatoes sold direct by a producer to a consumer in quantities of 150 lb. or more at a time, the maximum prices are 35s., 34s. 6d., 30s. 6d. and 26s. per bag respectively, free-on-rail producers' stations or delivery at the buyer's premises.

The wholesale price is 34s. 9d., 34s., 30s. 2d. and 25s. 4d. per bag, while the retail price for quantities less than 150 lb. is 3d. per 1 lb., 3d. per 1 lb., 8d. per 3 lb. and 7d. per 3 lb. delivered free of charge to the consumer.

The maximum price at which undergrade potatoes may be sold by any person is 10s. per bag.

These prices are the same as those fixed for summer potatoes of the last season.

The maximum price at which potatoes outside the controlled areas other than first grade (sized or unsized) potatoes, may be sold by any person has been fixed at 8d. per 3 lb., while the maximum price at which first grade (sized or unsized) potatoes may be sold by any person is 3d. per 1 lb. plus the transportation costs per 1 lb. actually incurred by the seller.

For full particulars see *Government Gazette Extraordinary* of 22 November 1946, and for previous prices see *Crops and Markets*, October 1946.

Index of Prices of Field Crops and Animal Products.

(Basic period 1936-37 to 1938-39 = 100.)

SEASON (1 July to 30 June).	Summer cereals. (a)	Winter cereals. (b)	Hay. (c)	Other field crops. (d)	Pastoral products. (e)	Dairy products. (f)	Slaughter stock. (g)	Poultry and poultry products. (h)	Combined index.
WEIGHTS.	19	13	2	3	34	6	17	6	100
1938-39.......	92	109	96	89	79	102	106	94	93
1939-40.......	86	114	77	95	115	105	103	89	104
1940-41.......	108	120	106	156	102	108	110	103	109
1941-42.......	120	144	143	203	102	131	135	136	124
1942-43.......	160	157	144	159	122	147	168	167	147
1943-44.......	170	186	137	212	122	154	185	188	159
1944-45.......	183	186	160	281	122	177	178	184	164
1945-46.......	201	194	164	312	118	198	184	170	170
1945—									
January.......	184	186	177	250	122	159	178	199	163
February......	184	186	171	235	122	180	177	217	165
March.........	184	186	182	245	122	180	177	233	166
April.........	184	186	173	246	122	180	176	259	168
May...........	198	186	173	288	122	184	170	273	172
June..........	198	186	190	320	123	184	176	275	174
July..........	198	186	191	316	118	210	180	188	170
August........	198	186	191	330	118	210	185	162	169
September.....	198	186	187	368	118	210	189	149	170
October.......	198	186	189	371	118	210	192	147	171
November......	198	194	194	380	118	204	193	153	172
December......	198	194	194	337	117	204	192	177	[illegible]
1946—									4
January.......	198	194	191	347	118	204	187	204	4
February......	198	194	158	305	118	186	183	224	7
March.........	198	194	160	280	118	186	180	241	3
April.........	198	194	176	298	118	186	179	279	7
May...........	249	194	170	284	119	186	176	289	1
June..........	246	194	178	287	119	218	177	260	7
July..........	245	194	182	303	120	231	181	193	7
August........	242	194	181	319	120	231	186	164	11
September.....	243	194	183	351	163	231	194	156	6
October.......	240	194	166	365	171	231	202	155	10
November	240	210	165	309	179	194	206	171	

(a) Maize and kaffircorn.
(b) Wheat, oats and rye.
(c) Lucerne and teff hay.
(d) Potatoes, sweet potatoes, onions and dried beans.
(e) Wool, mohair, hides and skins.
(f) Butterfat, cheese milk and condensing milk.
(g) Cattle, sheep and pigs.
(h) Fowls, turkeys and eggs.

Average Prices of Green Beans, Green Peas and Carrots on Mun Markets.

SEASON (1 July to 30 June.)	GREEN BEANS (Pocket 20 lb.).			GREEN PEAS (Pocket 20 lb.).			CARROTS (Bag). (a).		
	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39.......	1 8	2 3	2 0	2 4	1 9	1 2	3 8	2 6	6 1
1940-41.......	1 11	2 9	1 5	2 8	2 4	2 3	5 9	4 11	13 4
1941-42.......	2 7	3 10	2 6	3 11	3 3	3 4	8 5	8 11	17 2
1942-43.......	3 1	4 3	3 0	3 3	2 10	3 9	5 1	8 9	13 2
1943-44.......	3 8	4 11	3 0	4 11	4 10	4 11	9 11	11 1	20 2
1944-45.......	3 7	5 1	4 1	4 9	4 1	5 5	8 3	9 11	19 10
1945-46.......	3 4	4 7	3 6	5 11	7 2	6 1	8 10	11 4	17 1
1945—									
January.......	1 10	0 11	2 4	4 3	1 9	6 7	7 7	3 1	10 2
February......	1 7	3 4	2 3	5 5	6 9	7 4	7 8	6 11	19 1
March.........	2 3	4 11	2 6	7 7	12 0	6 7	9 5	6 3	25 4
April.........	1 11	2 8	1 10	4 4	6 6	4 0	8 6	13 9	19 6
May...........	3 3	5 3	2 3	5 9	9 11	3 1	9 5	8 7	21 6
June..........	4 3	4 2	5 0	4 9	7 9	3 8	10 0	10 10	13 9
July..........	9 10	7 10	5 10	8 2	11 7	8 8	10 1	16 4	20 11
August........	7 4	6 4	6 10	5 8	7 10	5 5	13 4	17 11	12 11
September.....	3 1	5 9	4 1	2 8	4 1	2 4	7 5	12 8	16 8
October.......	3 8	5 4	4 9	4 4	3 6	7 7	9 6	9 10	20 11
November.....	1 6	3 4	2 4	9 0	4 0	9 4	9 8	8 8	16 4
December......	2 4	2 3	2 8	12 1	—	12 5	10 9	7 10	13 10
1946—									
January.......	3 4	1 11	5 6	8 8	10 11	14 7	9 8	6 2	16 0
February......	1 11	—	2 3	6 5	—	6 4	7 3	7 11	14 1
March.........	2 10	1 1	2 5	6 1	—	3 4	8 10	8 1	23 10
April.........	2 7	3 4	3 1	5 7	—	4 10	10 2	9 3	24 2
May...........	1 9	3 0	2 2	7 2	3 10	5 10	7 1	6 3	18 8
June..........	1 10	2 0	2 8	4 8	4 1	5 7	4 2	7 6	11 7
July..........	3 2	1 11	2 2	2 7	3 6	3 4	3 8	4 8	7 10
August........	6 3	4 2	6 6	5 10	5 0	4 9	4 5	3 8	11 0
September.....	6 6	7 5	6 4	5 0	4 11	5 1	3 8	3 2	10 11
October.......	5 0	5 0	5 2	3 3	3 6	5 7	4 7	4 1	9 7
November.....	2 11	2 7	1 11	6 5	3 10	9 5	6 3	3 7	11 5

(a) Weights of bags vary, but on the average are approximately as follows:—Johannesburg, 130 lb.; Cape Town, 90 lb.; and Durban, 120 lb.

Average Prices of Eggs and Poultry on Municipal Markets.

Season (1 July to 30 June).	Eggs.			Fowls (Live, each).			Turkey Cocks (Live, each).		
	Johannesburg, New-laid. Per Dozen.	Durban, New-laid. Per Dozen.	Cape Town. Per 100.	Johannesburg.	Durban.	Cape Town.	Johannesburg.	Durban.	Cape Town.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39.......	1 0	1 1	7 11	2 6	2 4	2 7	10 7	12 7	10 3
1939–40.......	0 11	1 3	7 4	2 6	2 5	2 5	10 2	12 5	9 3
1940–41.......	1 1	1 3	8 3	2 11	2 10	3 0	8 5	12 0	9 8
1941–42.......	1 6	1 9	10 7	3 5	3 4	3 7	12 10	16 2	14 4
1942–43.......	1 10	2 0	13 5	4 6	4 2	4 8	16 3	16 10	15 0
1943–44.......	2 1	2 2	14 2	5 3	5 3	5 6	16 7	20 6	15 8
1944–45.......	1 11	—	14 10	5 1	5 6	5 9	16 8	18 5	18 7
1945—									
January.......	2 3	2 2	17 10	4 5	5 2	5 6	12 8*	17 8	17 0
February......	2 6	2 6	19 10	4 7	5 5	5 6	12 0	21 2	15 11
March.........	2 9	2 10	20 5	4 8	5 6	5 7	12 9	12 4	15 6
April.........	3 2	3 2	22 7	5 1	5 10	5 5	13 0	13 1	15 1
May...........	3 3	3 8†	26 0	5 4	4 11	5 4	13 10	14 9	15 1
June..........	3 2	3 5	25 11	5 11	6 1	5 11	13 0	16 7	21 1
July..........	1 10†	2 0	16 5	6 4	6 6	6 2	17 5	15 10	19 5
August........	1 7	1 6	11 11	6 1	6 8	6 0	18 4	18 9	22 2
September.....	1 5	1 5	11 0	5 6	6 3	6 1	17 10	19 7	24 8
October.......	1 6	1 7	10 11	4 8	5 11	5 8	17 3	20 5	13 8
November.....	1 7	1 8	11 7	4 4	5 5	5 7	15 6	20 1	23 6
ecember......	2 0	2 2	14 1	4 5	5 4	5 5	14 0	17 7	—
—									
nuary........	2 4	2 7	18 3	4 6	5 5	5 6	14 1	14 8	—
bruary.......	2 8	2 10	20 11	4 3	5 5	5 4	12 0	15 10	—
arch.........	3 0	3 2	21 6	4 7	5 9	5 8	12 4	14 3	—
ril..........	3 6	3 9	27 2	5 1	5 7	5 6	12 5	12 9	—
y............	3 6	3 10	28 6	5 8	5 9	5 3	13 9	18 0	—
ne...........	2 11	3 2	26 9	6 2	5 11	5 8	15 9	15 6	—
ly...........	1 11	2 1	16 2	6 5	6 1	6 1	17 1	17 8	—
gust.........	1 7	1 7	12 5	6 4	5 11	6 4	19 2	18 7	—
ptember......	1 6	1 6	11 7	5 6	5 9	6 3	18 5	16 10	—
tober........	1 7	1 9	12 3	4 5	5 2	6 1	17 11	17 3	—
vember.......	1 10	2 0	14 1	4 5	5 3	6 2	15 8	14 5	—

Prices of Turkeys: Live, each.
large, Grade I.

erage Prices of Cabbages, Cauliflower and Tomatoes on Municipal Markets.

Season (1 July to 30 June).	Cabbages (Bag). (a)			Cauliflower (Bag). (a)			Tomatoes (Trays 15 lb.).			
							Johannesburg.			
	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban.	N.M. No. 1.	Other.	Cape Town.	Durban.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39.......	3 10	3 0	3 10	3 0	1 8	3 5	2 2	1 3	1 8	0 10
1940–41.......	5 10	4 8	7 1	3 11	4 3	5 3	2 7	1 6	2 1	1 2
1941–42.......	8 10	5 5	11 5	5 9	5 7	7 11	3 1	1 9	2 3	1 6
1942–43.......	5 6	5 11	9 1	5 0	5 9	7 6	3 4	1 10	2 1	2 7
1943–44.......	11 1	7 4	17 6	9 2	6 2	12 1	5 5	2 9	3 7	2 0
1944–45.......	9 7	6 11	13 5	7 5	6 6	9 8	4 1	2 0	2 10	1 9
1945–46.......	10 1	7 1	10 11	8 4	6 5	11 1	4 11	2 4	3 4	1 7
1945—										
January.......	8 0	4 9	15 8	6 3	—	—	6 1	2 6	2 7	2 2
February......	7 8	8 6	22 4	9 5	6 11	—	3 0	1 2	3 1	1 1
March.........	8 5	10 5	24 1	8 8	—	8 0	3 4	1 5	2 5	2 4
April.........	8 7	7 11	14 8	7 7	9 7	11 4	3 4	1 5	2 6	1 7
May...........	7 6	5 4	11 2	7 3	6 5	10 10	4 0	1 10	2 4	1 10
June..........	8 11	4 3	10 6	11 7	7 7	14 10	3 11	2 1	3 0	1 1
July..........	12 2	5 4	11 0	12 3	5 7	11 0	3 7	1 10	2 9	1 2
August........	12 0	9 7	8 11	10 0	8 2	12 3	5 2	3 2	3 4	1 5
September.....	12 2	11 7	10 8	11 8	9 6	14 10	6 7	3 1	3 10	1 10
October.......	10 1	12 1	16 3	17 0	5 9	11 0	6 2	2 8	3 1	1 8
November.....	10 9	9 11	16 0	12 9	8 6	—	5 7	2 8	4 0	1 6
Desember......	14 2	9 10	17 7	26 0	3 6	—	3 0	1 1	3 11	1 1
1946—										
January.......	9 7	8 0	14 8	14 5	9 0	—	4 3	1 10	2 5	1 3
February......	7 3	9 1	18 1	10 10	6 6	—	4 2	1 7	1 11	1 3
March.........	8 11	7 3	14 4	7 2	9 8	3 4	6 2	3 8	2 6	1 6
April.........	9 10	5 8	9 0	6 7	15 4	12 4	8 1	3 6	2 8	2 0
May...........	8 4	3 4	7 7	7 2	5 3	8 11	6 3	2 11	3 8	2 3
June..........	5 10	2 4	11 0	7 7	3 1	12 1	4 2	2 0	2 10	1 5
July..........	7 11	1 10	9 9	8 6	—	11 3	2 2	1 1	2 3	1 0
August........	5 3	2 1	7 1	8 9	3 2	11 1	2 5	1 3	1 11	0 9
September.....	4 11	2 5	5 8	9 6	4 0	13 7	3 2	1 9	2 2	1 1
October.......	5 6	8 0	7 0	15 10	5 0	12 0	4 5	1 9	2 8	0 11
November......	5 7	11 5	12 0	13 4	3 9	—	5 2	2 1	3 4	1 1

(a) Weights of bags vary, but on the average are approximately as follows: For cabbages—Johannesburg, 150 lb.; Cape Town, 105 lb., and Durban, 90 lb. For cauliflower—Johannesburg, 100 lb.; Cape Town, 65 lb. and Durban, 85 lb.

Average Prices of Lucerne, Teff, Kaffircorn and Dry Beans.

SEASON AND MONTH (b).	LUCERNE (per 100 lb.). Johannesburg (a). Cape.	LUCERNE Johannesburg (a). Transvaal.	LUCERNE Cape Town 1st grade.	Teff Johannesburg (a) 100 lb.	KAFFIRCORN in bags (200 lb.). F.o.r. producers' stations. K1.	KAFFIRCORN F.o.r. producers' stations. K2.	DRY BEANS (200 lb.) bags. Johannesburg (a). Speckled Sugar.	DRY BEANS Johannesburg (a). Cow-peas.	DRY BEANS Johannesburg (a). Kidney.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	3 10	3 1	4 0	2 7	13 1	12 9	25 0	16 9	24 2
1939-40	3 0	2 5	3 4	2 6	8 8	9 4	21 11	13 11	21 2
1940-41	4 2	3 5	4 3	3 3	15 6	17 0	30 0	16 8	27 11
1941-42	5 7	5 2	5 8	4 7	18 10	19 6	32 10	19 8	28 3
1942-43	5 5	6 0	7 4	5 5	24 10	24 10	34 0	25 8	24 2
1943-44	5 4	5 6	7 3	4 5	21 0	21 7	49 6	29 11	32 1
1944-45	6 4	5 4	7 2	4 9	18 8	18 8	88 7	39 6	70 6
1945—									
January	7 3	5 7	7 3	4 1	23 1	23 1	118 8	45 11	98 2
February	7 0	6 9	7 6	—	22 0	22 0	122 3	45 3	95 3
March	7 2	5 10	7 3	5 5	22 0	22 0	107 9	42 11	89 3
April	6 10	—	7 8	5 2	22 0	22 0	109 11	53 4	104 8
May	6 9	5 7	7 6	5 5	20 6	20 6	111 1	61 7	97 1
June	7 6	6 9	7 9	5 8	20 6	20 6	102 2	67 11	95 2
July	7 6	—	7 9	5 9	20 6	20 6	105 8	67 1	80 10
August	7 6	—	7 9	5 9	20 6	20 6	93 7	66 3	80 7
September	7 4	—	7 9	5 9	20 6	20 6	87 0	67 2	74 8
October	7 5	7 6	7 0	5 9	20 6	20 6	91 2	70 8	68 3
November	7 6	6 9	7 3	6 6	20 6	20 6	106 3	68 7	79 1
December	7 6	—	7 3	—	20 6	20 6	104 3	61 7	60 6
1946—									
January	7 6	—	8 1	5 9	20 6	20 6	103 4	68 6	75 4
February	6 0	5 10	8 1	5 9	20 6	20 6	90 8	69 3	69 4
March	6 2	5 3	7 4	5 4	20 6	20 6	86 8	61 11	63 7
April	7 0	5 6	7 4	4 11	20 6	20 6	91 4	51 0	74 3
May	6 10	5 1	7 6	4 6	69 11	69 11	90 6	52 11	75 7
June	7 3	5 6	7 6	4 5	60 8	60 8	84 2	45 9	66 1
July	7 5	6 9	7 3	4 5	57 10	57 10	81 8	45 1	67 7
August	7 5	4 8	7 3	4 3	48 5	48 5	69 11	41 1	61 7
September	7 6	7 0	7 3	4 4	50 0	50 0	73 0	40 4	61 11
October	6 9	4 11	6 9	4 1	40 3	40 3	69 2	34 5	56 6
November	6 9	5 10	—	3 11	40 10	40 10	61 4	35 3	59 10

(a) Municipal Market.
(b) Seasonal year for kaffircorn, 1 June-31 May. Dry Beans, 1 April-31 March; Lucerne and teff, 1 July-30 June.

Prices of Avocados and Papaws on Municipal Markets.

SEASON.	AVOCADOS (Per Tray). (a) Cape Town.	AVOCADOS Durban.	AVOCADOS Johannesburg. Ordinary.	AVOCADOS Johannesburg. N.M.	PAPAWS. (b) Cape Town Std. Box.	PAPAWS. Durban. Tray.	PAPAWS. Johannesburg. Ordinary Std. Box.	PAPAWS. Johannesburg. N.M. Std. Box.	PAPAWS. Port Elizabeth Std. Box.	PAPAWS. Bloemfontein Std. Box.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	1 6	0 11	1 3	1 11	2 0	0 10	1 7	2 0	2 0	1 8
1939-40	2 1	1 2	1 9	2 11	2 3	0 10	1 4	1 9	1 11	1 6
1940-41	1 10	0 10	1 5	2 4	2 1	1 1	1 9	2 2	2 3	1 9
1941-42	2 4	1 7	2 1	3 4	2 5	0 10	1 10	2 1	1 11	2 0
1942-43	3 1	1 8	2 10	4 3	3 2	1 2	2 1	2 7	2 2	2 0
1943-44	4 1	1 6	3 7	5 3	3 2	1 5	2 5	3 5	3 3	2 7
1944-45	—	—	—	—	3 4	1 6	3 1	4 1	3 5	3 0
1945—										
January	3 11	—	4 10	7 2	3 10	1 5	4 1	4 9	6 5	3 6
February	2 0	2 3	2 6	4 3	2 8	1 10	5 11	7 6	—	5 5
March	2 0	0 11	2 3	4 4	4 10	1 10	5 4	6 9	—	4 10
April	1 10	0 10	2 7	3 11	4 9	1 8	4 5	6 2	4 11	4 6
May	2 4	0 9	2 5	4 3	4 7	1 6	3 7	5 0	4 7	2 11
June	2 4	2 5	2 10	6 1	4 4	1 11	3 7	4 6	4 0	3 6
July	3 4	2 4	3 10	5 8	4 2	1 9	4 10	5 9	4 11	5 0
August	6 8	3 10	4 2	7 4	5 10	1 5	4 10	6 1	5 3	5 0
September	5 4	3 1	6 5	7 0	3 3	1 4	3 3	4 1	2 7	3 6
October	7 2	3 8	8 1	7 4	2 7	1 5	2 5	3 5	2 2	2 4
November	9 5	3 6	6 6	8 0	3 6	2 0	2 7	3 7	6 7	3 2
December	7 8	1 0	7 1	—	4 4	1 0	3 11	5 7	5 10	3 6
1946—										
January	8 1	1 8	5 10	9 2	3 10	1 6	4 5	7 11	6 4	3 11
February	3 4	0 10	3 1	5 0	2 10	1 5	7 1	5 6	5 6	4 7
March	2 11	3 7	2 8	4 0	—	1 1	6 6	7 8	6 4	5 8
April	2 8	1 11	3 4	4 9	5 5	1 1	5 6	7 11	6 3	4 6
May	3 0	1 10	3 7	5 5	5 1	1 1	4 9	5 8	4 7	4 2
June	3 6	2 3	4 5	6 4	3 8	2 5	4 10	5 9	5 2	4 0
July	4 1	1 9	5 6	6 3	4 11	2 7	5 4	6 0	6 3	4 11
August	5 7	5 1	5 10	6 8	5 1	2 6	4 4	5 1	4 9	4 4
September	9 3	—	6 5	5 8	2 10	1 6	2 8	3 2	2 3	2 11
October	8 8	4 7	5 11	6 7	2 5	1 4	1 9	2 4	2 2	1 10
November	8 6	3 6	6 3	7 4	2 8	0 8	2 3	2 11	2 11	2 8

(a) Season 1 January to 31 December.
(b) Season 1 April to 31 March

Prices of Bananas and Pineapples on Municipal Markets.

Season.	Bananas (Per Crate) (*a*) Cape Town.	Bananas Johannesburg.	Bananas Pretoria.	Pineapples. (*b*) Cape Town. Box.	Pineapples Durban. Doz.	Pineapples Johannesburg. Ordinary. Doz.	Pineapples Johannesburg. Queens and Giants. Doz.	Pineapples Port Elizabeth. Box.	Pineapples East London. Doz. Large.	Pineapples Bloemfontein. Bushel Box.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	22 5	9 10	16 5	5 4	3 3	1 1	—	3 5	1 2	4 10
1939–40	24 4	8 7	15 10	6 1	3 10	1 4	4 8	3 10	1 5	4 9
1940–41	27 0	7 2	14 3	5 10	2 8	1 5	2 1	4 5	1 5	5 10
1941–42	28 6	7 6	14 6	6 6	3 0	1 7	2 5	4 6	1 8	6 2
1942–43	30 0	11 9	22 7	7 4	3 0	1 8	3 10	4 11	2 1	7 3
1943–44	37 8	13 2	18 10	8 3	3 6	2 4	2 1	6 3	2 10	8 4
1944–45	—	—	—	10 4	3 9	2 6	3 9	7 3	3 3	8 6
1945—										
January	31 9	12 11	14 0	7 7	—	1 4	2 2	6 3	2 4	6 3
February	32 8	13 5	16 7	5 11	—	1 5	1 3	5 4	2 7	6 11
March	27 1	13 7	14 8	6 3	—	1 7	2 5	4 11	4 7	5 6
April	34 11	14 10	17 4	7 4	—	2 2	3 5	5 9	2 11	6 4
May	30 11	10 3	13 7	8 4	2 9	3 5	2 10	9 4	2 7	8 2
June	31 5	9 4	12 6	8 10	2 7	5 4	5 9	10 9	4 4	8 6
July	33 11	10 6	19 4	13 2	2 5	7 1	5 6	17 7	3 5	15 3
August	38 1	16 1	16 4	12 9	4 1	5 4	5 9	13 8	3 3	13 11
September	53 7	20 3	13 1	11 7	8 3	5 9	6 2	10 4	5 0	15 8
October	70 8	41 1	33 4	13 1	10 7	7 6	5 8	16 0	4 6	14 1
November	68 0	32 4	25 1	10 10	10 9	4 5	5 0	12 4	4 10	13 6
December	75 11	17 7	11 1	10 7	7 4	3 4	4 6	7 7	5 9	8 5
1946—										
January	31 9	14 4	14 11	10 4	3 0	3 5	3 4	8 7	2 9	9 3
February	54 3	12 0	13 8	8 4	2 9	2 8	4 0	8 5	4 6	9 7
March	69 7	17 3	28 6	9 10	5 9	3 0	3 8	7 1	6 7	11 6
April	75 5	29 5	17 7	11 8	5 7	4 0	5 4	9 5	2 7	9 4
May	76 8	29 8	22 2	7 6	4 6	3 4	3 6	8 3	3 10	8 7
June	77 11	23 5	26 7	10 7	5 0	4 7	4 7	7 5	6 3	12 3
July	60 11	23 4	25 8	15 7	3 2	9 3	10 3	15 5	5 7	13 5
August	72 1	23 9	31 5	19 10	4 10	7 11	9 7	16 10	4 7	13 10
September	66 5	20 6	30 5	10 1	7 7	6 5	7 2	12 2	4 7	13 11
October	78 10	28 6	34 6	15 5	6 5	6 9	6 5	13 10	4 3	14 5
November	63 8	47 10	32 4	14 10	8 11	6 3	5 4	13 10	4 6	15 11

(*a*) Season 1 January to 31 December.
(*b*) Season 1 October to 30 September.

Average Prices of Onions and Sweet Potatoes on Municipal Markets.

Season (1 July to 30 June).	Onions (120 lb.). Johannesburg. Transvaal.	Onions Johannesburg. Cape.	Onions Cape Town. Cape.	Onions Pretoria. Cape.	Onions Durban. Local.	Onions Durban. Cape.	Sweet Potatoes. (120 lb.). Johannesburg. Table.	Sweet Potatoes Durban.	Sweet Potatoes Cape Town.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	8 3	8 10	7 4	7 10	8 6	9 6	5 7	4 8	5 3
1939–40	6 3	9 10	7 3	9 11	9 8	10 5	5 7	5 9	5 0
1940–41	12 5	12 3	9 10	11 11	11 2	12 7	7 3	6 4	5 5
1941–42	10 5	13 11	10 4	13 10	13 0	14 3	9 10	7 1	8 4
1942–43	13 8	14 0	12 6	14 7	12 9	14 5	9 8	8 1	8 5
1943–44	16 2	18 9	15 1	17 4	19 1	19 2	12 0	10 9	10 7
1944–45	14 7	18 7	14 8	18 1	18 8	19 5	17 3	15 1	16 3
1945—									
January	12 9	13 1	9 11	14 8	12 3	13 5	18 2	7 8	14 7
February	13 5	13 10	9 9	10 4	12 2	14 0	16 0	8 1	10 8
March	13 10	15 2	11 4	14 9	18 9	17 0	12 6	9 6	12 5
April	17 8	17 5	14 6	16 9	12 6	17 8	9 11	7 5	9 1
May	16 4	17 11	12 0	18 0	19 11	20 10	10 4	7 1	11 4
June	20 3	17 11	14 4	18 4	15 4	18 1	9 4	8 2	9 4
July	16 7	18 7	15 5	16 8	17 7	20 5	10 4	8 8	12 4
August	18 7	18 4	15 7	18 3	16 9	19 4	11 3	8 9	12 1
September	16 1	17 7	16 1	19 11	19 3	20 5	15 0	12 11	14 2
October	10 8	14 5	12 11	14 8	10 4	15 10	19 0	15 6	17 0
November	12 3	9 3	13 0	—	14 3	13 10	19 11	19 1	21 3
December	14 8	15 3	15 6	17 10	16 11	15 7	17 1	14 6	17 7
1946—									
January	12 0	12 1	9 7	—	11 7	13 0	17 1	15 6	17 3
February	12 3	13 8	11 1	13 1	15 2	9 11	17 3	10 3	17 2
March	11 4	12 4	9 9	12 10	12 9	13 5	18 5	14 8	14 8
April	12 1	12 10	11 3	13 10	15 1	14 9	15 2	17 4	14 7
May	13 6	13 9	11 9	13 9	12 10	14 7	15 8	15 6	14 5
June	14 7	15 5	12 2	17 1	15 11	14 11	14 11	14 8	15 1
July	11 10	14 3	12 0	15 0	15 2	15 6	15 2	15 2	17 4
August	14 9	17 0	13 7	15 10	20 6	18 7	16 10	16 0	18 3
September	20 9	25 3	20 4	23 2	21 5	23 3	20 0	16 5	22 11
October	24 9	28 1	32 5	24 0	32 3	31 8	24 6	16 9	20 10
November	21 11	—	26 11	—	24 8	21 1	23 10	15 1	20 8

G.P.S.9955—1946-7—7.600.

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ANNUAL REPORT OF THE DEPARTMENT OF AGRICULTURE FOR THE YEAR ENDED 31 AUGUST 1946.

G.P.-S.10493—1946-7—7,600.

CONTENTS (continued).

CONTENTS (continued).

Information on Departmental Publications.

Farming in South Africa, the monthly journal of the Department, contains popular as as well as scientific articles on a variety of agricultural topics, useful to both the farmer and the housewife, while the Crops and Markets Section supplies information on crop prospects, market prices and exports of agricultural produce.

The following particulars in regard to subscriptions and advertisements should be noted :—

Subscription.—Within the Union, South West Africa, Bechuanaland Protectorate, Southern Rhodesia, Swaziland, Basutoland, Mocambique, Angola, Belgian Congo, and British Territories in Africa, 5s. (otherwise 7s. 6d.) per annum, post free, payable in advance.

Applications, with subscriptions, to be sent to the Government Printer, Bosman Street, Pretoria.

Advertisements.—The Tariff for Classified Advertisements is: 2d. (two pence) a word with a minimum of 5s. per advertisement (prepaid). Repeats, not entailing any change in the wording, will be published at half the cost of the original.

Conditions:

(1) The advertisement will be classified under specific headings, and only one black letter (initial letter) is permitted.

(2) Advertisements in which prices are mentioned must contain the name and address of the advertiser. A nom-de-plume or box number only is not sufficient, and unless this condition is strictly observed, advertisements will not be accepted.

(3) Advertisements will be classified strictly in accordance with the subject-matter of the announcement, determined by the first item mentioned and cannot be inserted under irrelevant headings.

(4) Displayed, classified advertisements will also be accepted. The charge, however, will be 10s. per inch, single column, per insertion, without reduction for repeats.

Copy for Advertisements to be in the hands of the Government Printer, Pretoria, not later than the 20th of the month preceding publication.

Send all advertisements direct to the Government Printer, or write to him for details as to tariff for advertisements.

Popular Bulletins.—Bulletins on various agricultural topics are published by the Department to meet public demand. A list of available bulletins giving particulars of cost, etc., is obtainable free of charge from the Editor, Department of Agriculture, Pretoria.

Scientific Publications.—From time to time the different Divisions of the Department issue science bulletins incorporating the results of research work conducted by them. Other scientific publications issued are: "The Onderstepoort Journal", "Memoirs of the Botanical Survey of South Africa", "Bothalia", "Entomological Memoirs" and the "Annual Reports of the Low Temperature Research Institute". Information in regard to these publications is obtainable from the Editor, Department of Agriculture, Pretoria.

Press Service.—The Press of South Africa is now supplied with a bulletin of agricultural information for their exclusive use. This information is supplied to all newspapers and other journals throughout the country.

Farmer's Radio Service.—In addition to the printed information supplied by the Department to members of the farming community, the Department, in collaboration with the South African Broadcasting Corporation, also has a national broadcasting service for farmers. Information in regard to times of broadcasting is contained in the programmes issued by the Broadcasting Corporation.

Inquiries.—All general inquiries in regard to the above should be addressed to the Editor, Department of Agriculture, Pretoria.

D. J. SEYMORE, Editor.

The Post-War Agricultural Industry.

Report of the Department of Agriculture for the year ended 31 August, 1946.

Dr. C. H. Neveling, Secretary for Agriculture.

A year ago a general feeling of optimism prevailed, for the six years of devastating war had just ended and the hope was cherished that our agriculture which had emerged from the war reasonably sound, would gradually revert to normal. But who could foresee what Providence had in store for us, and in our optimism we little dreamt that the ensuing year would be one of the most difficult ever experienced in the history of our agriculture. For the third successive year the country has been scourged by drought and none but our farmers know what it means to see their lands stretching out dry and barren before them, or sparsely covered with poor crops, to see clouds of dust moving over their veld and their animals reeling with hunger and thirst. How can we admire sufficiently the tenacity of purpose and perserverance of those courageous farmers who, seeing these pitiful sights, do not abandon hope and still have faith in the morrow?

The Food Position.

Once again the drought has taken a heavy toll and once more the farmer has been put to the test. But this year the drought held even graver implications for the country as a whole, for with such a serious world food shortage the country has, more than ever before, had to rely on home production for her food supplies. A poor wheat crop, followed by a drought in the maize belt, was one of the most serious misfortunes which could have overtaken the country. When the Food Mission went to London at the beginning of February to interview the Ministry of Food as our *buyers* and to submit our case to the London Food Board, the future was black indeed. Conditions were such that there was but little hope for any maize crop worth mentioning. The maximum quantity expected at that time was 12,000,000 bags.

Frost and cold were, however, late in coming (which may perhaps presage abnormal conditions for summer) and as many maize farmers risked planting late in summer, a crop was harvested which, under the prevailing circumstances, by far exceeded the most sanguine expectations. Crop estimates place the harvest at approximately 18,000,000 bags and this crop, together with the 4,000,000 bags which we were lucky enough to acquire from the Argentine, may be assumed to be adequate for satisfying the country's most pressing needs and for tiding her over her difficulties, provided that the supplies are husbanded.

In so far as wheat is concerned, the country was faced with an equally difficult position for, according to threshing-machine returns, this crop amounted to only, 2,800,000 bags, and as a heavier demand existed, this quantity together with the carry-over of barely 733,000 bags was wholly inadequate and consequently had to be supplemented, whatever the price. According to estimates, approximately

3½ million bags had to be imported, if distribution were to be maintained at a reasonable level. The final quantities allotted to the Union by the International Food Council were, however, much less, only 1,435,000 bags of wheat, 545,000 bags of flour and 23,340 bags of meal having been imported into the Union during the year under review. It stands to reason that the Department was obliged to apply the most stringent measures of economy in an endeavour to satisfy the country's needs out of the limited supplies, until the next crop which, fortunately, is very promising, becomes available.

The barley crop was most disappointing, the yield having been 180,000 bags less than that of the previous year, and recourse had to be had to restrictive measures and rationing, in order to ameliorate the position to some extent. *Inter alia,* no barley was allowed for animal fodder during the period December 1945 to the end of August 1946, but, nevertheless, 150,000 bags of barley had to be imported from outside the Union for feeding purposes. Of this quantity, 115,000 bags have already been received.

In the case of oats the quantity acquired by the Wheat Board was not even half the extent of the previous season's crop and, in view of the considerably heavier demand for this product, the Wheat Board was authorized to import 1,650,000 bags of oats by way of supplementing the local production. Of this quantity, 1,387,000 bags have already been landed.

In so far as both barley and oats are concerned, the 1945-46 season was a difficult one and the position was aggravated by the serious maize shortage which strongly affected the demand for these products. Hence, in fixing the prices, the feed value of barley and oats as compared with that of maize, was the deciding factor.

The rye position, on the other hand, was affected by the shortage of wheat, since rye bread is an acceptable substitute for supplementing the country's bread shortage. As in the case of the other winter cereals, the available amount of rye was also inadequate and the Wheat Board was granted permission to import 287,000 bags, of which 223,000 bags have already arrived. The restrictive measures which were made applicable to wheat and wheaten products, were also partially imposed in respect of rye and rye products.

The cereal shortage which has already obtained for a few years and which reached its nadir this year, is having a most serious effect on agriculture and is bound to leave deep traces behind. A gratifying increase in the feeds of livestock (cattle, pigs and fowls) took place during the war years—a fact which is indicative of improved farming methods and stability, but, unfortunately, the cereal shortage and the serious protein shortage threatened not only to hamper further progress, but also to nullify the progress already made. Naturally, the satisfaction of human needs is a primary requirement, and consequently, the feeding of animals had to be drastically curtailed. The dairy farmer, the pig farmer and the poultry farmer had to content themselves with the barest minimum for meeting their requirements. In view of the improvement in the maize position and in order to safeguard the fresh-milk supply of the cities, the ration for the urban fresh-milk producers was, however, slightly increased. It was not possible to make the same concession to producers of milk for industrial purposes or to pig or poultry farmers.

Rationing.

The serious shortage of food outside as well as within the Union, especially the shortage of wheat and maize, has compelled the Government to decide on the coupon-rationing system. The fact that

this proposed rationing system has been placed under its own organization, separated from the Ministry of Agriculture, has given rise to considerable agitation amongst the farming population, since it is feared that the marketing and distribution functions of the boards of control under the Marketing Act will be affected thereby. The perspicuous statement of the Acting Prime Minister to the effect that the boards of control will continue to function under the Minister of Agriculture as in the past and that the Director of Food Supplies and Distribution will exercise a general direction only, in respect of the distribution of products under the control of the boards has, however, induced farmers to view the matter in its true perspective. Moreover, the temporary nature of the emergency measure has been repeatedly emphasized by the Government.

The difficult position created in the Union in so far as its food supply is concerned, by the drought, had a salutary effect inasmuch as the city-dweller and the farmer have been brought closer together. The city-dweller has realized that the farmer is powerless against Nature, that even his utmost efforts at production may be of no avail and that his existence it a most precarious one. The farmer, on the other hand, has felt the greatest sympathy for the urban housewife who has had to stand in queues to secure the family's food requirements.

Reconstruction of Agriculture.

Although, from a production point of view, the year was most abnormal, considerable progress has been made in regard to the reconstruction of agriculture and during the past year the foundation has been laid for a sounder, more stable and more prosperous industry. At the beginnig of the year the Government announced its policy in respect of agriculture in a "White Paper". This document should be in the hands of every farmer, and the leaders of the farming community, in particular, should study its contents carefully. The main theme of the White Paper is a plea for conservation farming and economic stability, the only means of achieving a sound and efficient agriculture, capable of contributing towards a higher standard of living and an improved nutrition for the nation as a whole.

The White Paper briefly outlines the proposed programme of action envisaged for developing agriculture to a high level of efficiency and utility and maintaining it at that level. It aims mainly at:—

(1) Encouraging the general practice of conservation farming at an early date, in order to protect and build up our soil, water and useful vegetation; and

(2) enhancing the productivity of our farming by raising the educational standard of the farmer, encouraging more modern farming methods, raising the efficiency, and so also improving the standard of living of farmers and their labourers, promoting price stability, ensuring a market for the increased production required for better national nutrition, and making better transport and auxiliary services available.

Conservation farming is not merely a synonym for soil-erosion control. We must discard the idea that conservation farming consists merely of the application of soil-erosion control measures, for it has a far wider scope and the malpractices, which have to be eliminated, are extremely deeply rooted. The present piracy farming systems have to be superseded by a new approach aiming at the reclamation of our vegetal cover, and the restoration of our soil

and water resources. The key to conservation farming lies in the employment of our farming systems in such a way that they link up with natural conditions in order that the basic causes of erosion, denudation, exhaustion and loss of water can be eliminated. The soil-improvement aspect cannot be sufficiently strongly emphasized for only along this road can farming in our country, with its poor, easily eroded soils and variable climate, be stabilized.

Agricultural Legislation.

In giving effect to the policy as set out in the White Paper, the Government enacted during the last Parliamentary session a number of agricultural laws designed to promote agriculture. These laws testify to the serious attitude towards this matter on the part of the Government and the Department and comprise the Wool Act, the Soil Conservation Act, the Livestock and Meat Industries Act Amendment Act and the Amendment to the Marketing Act.

The *Wool Act* gives stability to the most important agricultural product of the Union. Wool is such an important farm product that the stabilization of its price exercises a beneficial influence on many other branches of agriculture. A penny per lb. rise in the price of wool means an increase in the income of the country of £1,000,000 and it has often been said, and not without some truth, that the price of wool can be regarded as a barometer of the welfare of agriculture.

The past year has witnessed a big change in the wool position. Due to the drought in Australia, and to some extent also to the fact that the accumulated stocks of South African wool were representative of our clips, the Union has disposed of very large quantities of wool during the past wool year. Whereas at the time of the London Wool Conference last year the stocks on hand in the Union comprised more than 2,000,000 bales, they now amount to barely a quarter of this figure. We should, however, guard against being lulled into a false sense of security by this state of affairs. True, the wool has been sold, but it has not yet been used, and may still affect future prices. In addition, both Australia and New Zealand still have considerable quantities on hand.

The favourable turn of the sales has considerably lightened the financial burdens of the Union and consequently also of the wool farmers under the Wool Disposal Scheme. Unless local organization is obliged, through the trend of affairs, to absorb large quantities of wool at the reserve price—and this does not seem likely—the capital expenditure, interest and storage costs will be much less than the figure estimated by the Conference. The effect is already reflected in the lower levy of 7½ per cent. instead of the 13 per cent., estimated earlier. The levy of 7½ per cent. is perhaps still somewhat high but in considering the figure, it was felt that it would be preferable to build up a fund during the first year, rather than demand high contributions from farmers later, when conditions may perhaps not be as favourable.

The *Soil Conservation Act* creates the framework for the improvement of our farming systems and methods, for the restoration and improvement of our soil fertility and for the raising of productivity. The agricultural organizations were consulted step by step on this important legislation, through the Agricultural Advisory Council, and the representatives not only made a constructive contribution towards the measure, but also promised their full support.

The framework has been established, and it now rests with the farmer to make use of it, with the assistance offered by the

Department. The Soil Conservation Board will shortly be constituted when the machinery under the Act will be ready for operation. Farmers themselves should take the initiative. The State will supply financial assistance and the Department technical guidance, but the main task will rest with the farmers themselves. It is a serious task, this task of conserving, improving, and safeguarding the soil for posterity. It is a long process calling for perseverance and courage, for disappointments will not be lacking, and above all, it is a task calling for close co-operation. The individual alone will not be able to effect much, but the concerted action of a group will even change a desert into a paradise.

The *Livestock and Meat Industries Act Amendment Act* is not important in itself, but it constitutes part of the larger whole of the increased productivity of improved farming. An improvement of the arable land and of the grazing should go hand in hand with livestock improvement.

Much has been achieved during the past decade by the application of this Act, but in the programme of reconstruction, livestock will have to play a more important rôle than ever before and, with due regard to the limitations imposed by specific natural conditions, the aim should ever be for improvement.

The much-discussed *Marketing Act Amendment Act* led to a great deal of misunderstanding. For this reason the Government has decided that a select committee of Parliament should investigate the operation of the Act next year in the light of the reports of the Marketing Council and the Distribution Costs Commission. It can only be hoped that the investigation will end all misunderstanding and that light will be thrown on the actual aims and objects of the Control Board system.

The chief aim of the amendment was to render it possible to place the Meat Scheme permanently under the Marketing Act. The Meat Scheme has not been transferred to the new organisation of the Director of Food Supplies and Distribution, but will remain under the Minister of Agriculture and will be administered in closest contact with the Department. Only after the report of the Marketing Board on the scheme has been received, will further consideration be given to its incorporation under the Marketing Act. *The year 1946 will stand out as a landmark in the history of the Agriculture of this country.* When the present shortages of food and animal fodder have long been forgotten, the year 1946 will still be remembered as the precursor of the new era in which our farming was placed on a sound footing, marking the beginning of efficiency and prosperity.

What of the Future?

In considering the more immediate aspects, the production trends of the coming season and of the future, it may be mentioned that authorities on the international food position are of the opinion that it will take at least two crop years before the present cereal shortage can be supplemented by world production and that, in so far as animal products are concerned, it may even take as long as 4 years. What are the implications of this world position in so far as our agriculture is concerned, and how must we organize our agricultural production so as to ensure the maximum services to the country from a national point of view?

Briefly, the emphasis must be laid on cereal production for at least another year. Animal products, on the other hand,—meat dairy products, eggs—are assured of a good market for the next four or five years. In these circumstances, the chief developmental

trend need not be retarded by a too small demand. If there is no local market for all the animal products—and under modern nutritional tendencies there is still scope for further expansion before this stage will be reached—foreign markets will absorb them all.

Cereal production, either as concentrates, silage or green feed, also forms the basis of a sound livestock industry. Although unsuitable land had to be used during the war years for the production of concentrates and although the soil fertility was exhausted and will seriously hamper future reconstruction, it nevertheless does not represent a dead loss to agriculture. Large areas of these lands are capable of being used for fodder production and will facilitate the keeping of more livestock in our farming concerns. The further emphasis on increased grain production, unfortunately, has the disadvantage that for another year less attention will be paid to the expansion of our livestock population. Consequently, the Department is anxious that we should keep our livestock population at its present level at least, and the Department itself will do everything in its power to maintain the livestock industry until the dawn of better times, in spite of the critical grain position obtaining in the world to-day.

If the Union cannot at present be self-sufficient as regards cereals for the nutrition of its population, the question arises as to where the country will in future obtain sufficient cereals for the feeding of its animals. In this respect, however, an optimistic outlook is justified, for we should not lose sight of the fact that our agricultural potential has been enormously increased during the past four or five years, although the total yields were not always maintained at the same level. Moreover, we should not forget that agriculture has suffered severely and is still suffering as a result of a shortage of instruments of production such as fertilizer, agricultural implements and machinery, as well as labour. Should the Union have sufficient of thest three essential instruments of production at her disposal and experience a good season, the yield may yet be the source of a pleasant surprise to us.

Fertilization is a most important factor in the achievement of higher and more profitable yields, but it has been contended that agriculture has been as seriously hampered during the past few years by a shortage of machinery and labour as by a shortage of fertilizer. The shortage of labour may be partially remedied by the use of more and effective labour-saving machinery and it is in this respect that *our* agricultural industry has been particularly restricted. In spite of labour shortages in the farming industry, the agriculture of the United States, and even that of England, broke world records in respect of their crops because they had free or almost free, access to agricultural machinery. England's traction power has expanded phenomenally and the figures for farm machinery for the U.S.A. show an even more striking rise.

Last year it was hoped that the Union would be reasonably well supplied with agricultural implements and machinery by the second half of the year, but strikes in America have frustrated this hope. The supply is gradually improving and it would appear that by next year the most urgent requirements will have been met.

Farm labour still furnishes a serious problem. During the war years extensive use was made of the services of Italian prisoners-of-war, but the repatriation of the prisoners-of-war is contemplated, and although this loss of labour can be partially remedied by labourers who have been demobilized from the armed forces, it is still necessary for our farmers to form a clear idea of the labour

position of the future. The questions arise as to whether agriculture will again have such a plentiful supply of labour at its disposal as in the past, or whether the farming concerns will have to adapt themselves to the changed circumstances, and whether more machinery will have to be imported or the available labour utilized more effectively. Under stress of circumstances, South-African agriculture developed historically on the basis of the labour supplied by the unskilled and often uncivilized native. In the nature of things, the industry could hardly reach a higher level of efficiency than that permitted by its labour. In this respect one is reminded of the nick-name "kafferboerdery" of which, unfortunately, too many instances still abound.

During the following two decades it will be *imperative* to raise our labour efficiency in farming, if our soil-conservation programme is to be carried out and the productivity and net revenue from our agriculture increased. The time has come for a more intensive concentration on the training of farm labourers. Training schools where natives, and even coloureds, can be trained for farm work will not only be a boon to agriculture but also a national asset.

The European farmer is not above criticism in this respect. Insufficient knowledge of farming practices and of the inter-relationship between the plant and nature is a big contributory factor in the decline if our agricultural production to the low level on which it finds itself to-day. The raising of the general standard of education of the country districts and a better knowledge of the scientific basis of agriculture are prerequisites of advancement.

Grain Bags.

The supply position as regards grain bags and also wool bags is far from reassuring. It is expected that sufficient bags will be available for the present maize crop and the coming wheat crop, but the same cannot be said of next year's crop. The fact that we are faced with a most serious problem is fully appreciated and strenuous efforts are being directed at remedying the position. Control of jute goods has been re-introduced and drastic measures will be necessary for ensuring that bags are saved and their lives lengthened. The urban consumer who ultimately receives these bags can do much towards ensuring that no bags are wasted and that every empty bag is returned to the producers.

As a result of the smaller jute crop and the increased demand since the end of the war, a world shortage of bags has arisen. Since the Union cannot obtain stocks direct from India, the country has no option but to endeavour to obtain second-hand bags from other countries. Every effort is being made to accomplish this and any usable bag, irrespective of its size, is acquired. As a result of the general scarcity, many countries, have, however, imposed restrictions on the export of jute goods and consequently free purchases cannot be made.

From the above it is evident that the Union will have difficulty in securing her requirements. Consequently the processing of fibres obtained from our own production and from neighbouring states, is a matter which is at present receiving serious attention. The planting of fibre plants is confined to certain areas but the production can nevertheless, be considerably increased. The shortage of bags has unfortunately been aggravated by the shortage of paper containers which in many cases can be utilized as substitutes for jute bags.

Consideration is naturally also being given to the possibility of easing the problem by rendering bulk storage-space available.

Protein-rich Foodstuffs.

Since the quantity of feed given to animals has increased to such an enormous extent and since animal feeding plays such an important rôle in the production of protective foods, the lack of adequate proteins for use in balanced rations has resulted in a most serious position.

In 1939 the consumption of balanced nutrients amounted to approximately 12,000 tons, representing a value of about £10,000, whereas in 1945 it increased to about 248,000 tons, and the consumption for the year under review is estimated at 300,000 tons, with a corresponding value of about £3,500,000.

Proteins.—On the basis of the consumption during the past few years, the annual requirements of protein-rich foodstuffs amount to about 75,000 tons. Of these about 60,000 tons represent vegetable proteins of which more than 90 per cent. have to be imported, and 15,000 tons, animal proteins, of which about 33⅓ per cent. have to be imported.

As a result of the world shortage of oil-bearing seeds and the fact that we will be able to obtain a small portion of our requirements only by importation, strenuous efforts are being made to effect as large an increase as possible in the local production of groundnuts. The groundnut has a very high oil content—the demand for which is heavy—and yields the valuable oil-cake which enjoys such a wide market.

Under the stimulus of the Department, which is referred to elsewhere in the report, the groundnut crop increased to a quantity estimated at 250,000 bags, as against 120,000 bags in 1945, and the Department is endeavouring to induce farmers to plant for the next season at least 20,000 bags of groundnut seed, which quantity is capable of producing an estimated crop of 25,000 tons, of which approximately 18,000 tons can be utilized for the production of oil and oil-cake.

Bonemeal. The quantity of bonemeal produced locally during the year amounted to 23,938 tons, which amount represents an increase of 3,000 tons on the production of the previous year, but against this, our annual requirements are at present about 35,000 tons. The available supplies are therefore wholly inadequate, but it is hoped that the improvement which has been effected in the transport facilities will result in a larger collection of bones and an increase in the production of bonemeal. The prohibition of the utilization of bonemeal as a fertilizer still remains in force and the manufacturers of feed mashes also have to use imported bonemeal for their products.

As a result of the serious shortage in respect of protein-rich nutrients, bonemeal and animal licks, the Department was compelled to take special steps, as in previous years, for obtaining supplies and for distributing available supplies on as equitable a basis as possible.

Fertilizer.

During the past 12 months the demand for fertilizer once again far exceeded the available supplies and the serious shortage of this indispensable requirement necessarily had a hampering effect on the production of food. Actually, the demand has increased as a result of the appeal for increased production and also as a result of the return of so many of our farmers who served in the armed forces.

True, there was an improvement in the phosphate position, but owing to the increased number of applicants for whom provision had to be made, the basic quota per morgen could not be increased.

Supplementary grants were, however, made in special circumstances, e.g. in cases where it was deemed necessary to encourage increased production of maize, wheat and other essential products.

The Government is making every possible effort to obtain additional supplies, but present indications are that a general improvement of the position cannot be expected in the near future. There are two factories in our country which are at present converting rock phosphate into superphosphate, and a third is under construction. The maximum production of the two existing factories is approximately 300,000 tons per annum. It is not expected that any considerable improvement will take place before the third factory has reached the production stage.

The control of fertilizer is being continued and the Controller of Fertilizer had a quantity of some 283,000 tons of superphosphate and 18,000 tons of Gafsa rock phosphate from Egypt available for distribution.

Due to shortage of fertilizer, a big demand for Karroo manure and other manures arose, and it was found necessary to fix prices and to prescribe conditions of transport on account of the large dimensions of the trade.

The following prices have been fixed for fertilizer as from 1 July 1946:—

Kind of fertilizer.	*Maximum price per 2,000 lb. (in bags).* £.	s.	d.
Superphosphate 19 per cent.	7	8	0
Superphosphate 18 per cent.	7	7	0
Superphosphate 17·1 per cent.	6	13	0
Superphosphate 15·1 per cent.	5	18	0
Rock phosphate and Superphosphate-mixture	5	18	0
Calcium chloride	23	7	6
Ammonium sulphate	20	0	0
Ammonium phosphate	23	5	0

These prices are quoted f.o.r. seller's station and farmers receive a subsidy of £1 per ton. For quantities of less than 2,000 lb. but not less than 200 lb., the prices must be in proportion to the price per ton.

In the case of kraal manure, mixed manure and agricultural lime, the following prices were fixed as from 25 January 1946:—

Kind of manure.	*Per 2,000 lb. free on rail sender's station.* s.
Crude kraal manure	14.
Sifted kraal manure	16.
Ground kraal manure	30.
Crude compost	16.
Sifted compost	30.
Agricultural lime	20.

These prices do not include the price of the bags and when the manures are sold in bags, the prices of kraal manure and compost may be increased by 1s. per bag and those of agricultural lime by 10s. per ton.

Weed Control.

The control of weeds is closely related to the whole problem of soil conservation and veld improvement and the steps taken in this direction were crowned with a considerable measure of success in almost all spheres and in respect of most proclaimed weeds. Only in isolated cases did the Department find it necessary to give assistance for the eradication of weeds along the river banks, but it is hoped that this service will be withdrawn in the near future.

The eradication of weeds nevertheless continues to be an uphill struggle and there appears to be no justification for relaxing the measures for the control of this evil. The Department welcomes the representations made from time to time for a stricter application of the provisions of the Weed Act and the reorganization and extension of the field services of the Department are also directed at more effective weed control.

The eradication of the prickly-pear pest has now reached a stage where the discontinuation of the two schemes which were put into operation in the biological area and which were dealt with in last year's report can be contemplated. In this area, originally estimated at 1,000,000 morgen, the cactoblastis, and later the cochineal insect, were released, but in order to assist the latter insect in its process of destruction, it was decided to chop down the prickly pears and to leave the work of destruction to the cochineal insect It is estimated that when the scheme has finally been concluded in the biological region, an area of approximately ¾ million morgen will have been treated in this manner.

The desirability of also granting State assistance for the destruction of prickly pear to certain areas outside the present biological area in those cases where the infestation will justify the employment of the departmental scheme is, however, being considered.

The activities of the Department in the field of weed eradication are gradually expanding and the eradication of bush is already being undertaken on a large scale in Zululand, where valuable experience is being gained, which can at a later date be applied in other areas where the problem of bush encroachment has arisen. Work in this connection is being seriously hampered by lack of heavy implements, but as more machinery becomes available, the work is carried out more rapidly and more effectively.

A contract has recently been concluded with a private company for the emplyoment of tractor-driven machinery by way of an experiment, for the eradication of tree stumps, and if the experiment proves a success, the Department will consider the posibility of having this work done by private enterprise under contract.

Locust Destruction.

During the year under review no destruction campaigns were undertaken by the Department, either in the Union, South West Africa or the Bechuanaland Protectorate against hoppers of the brown locust or red locust. The Union, however, assisted with the destrution of extensive outbreaks of the red locust at Lake Rukwa in Tanganyika Territory.

The Brown Locust (Locustana pardalina Wlk.).

As forecast in the previous annual report, no incipient hopper outbreaks occurred during the first half of the summer season and, as a result of the protracted drought which continued well into the second half of the summer in most of the outbreak districts, the solitary-phase population remained at a low level throughout the greater part of the country.

In parts of some districts, however, sufficient rain fell during January, March and April to bring about a rapid increase of the solitary phase, with the result that the solitary flier population reached a critical density in parts of nine Karoo districts before the winter set in, and prevented further breeding. From this it is concluded that incipient hopper outbreaks may be expected with the first general rains of the coming summer in the following districts:— Hanover, De Aar, Richmond, Phillipstown, Colesberg, Hay (Griqua-

town), Hopetown, Fauresmith and Jacobsdal. If the later summer rains are adequate, infestation may spread to other districts before the winter.

Small-scale *gregaria* hatchings occurred on two old nests, one in the Warmbad district, South West Africa, where about thirty small swarms were destroyed by the farmers themselves, and the other on a two-year-old nest in Kenhardt, Cape Province, where the hoppers were destroyed by birds. Small hatchings of an incipient nature occurred in the northern part of the Calvinia district during November, on a narrow strip where an isolated shower of rain had fallen. In this instance the hoppers died of starvation as a result of the severe drought conditions.

The prospects for the coming season are that extensive incipient hopper outbreaks will occur in the nine districts mentioned, and that infestation will increase considerably during the second half of the summer if climatic conditions favour the breeding of later generations.

The Red Locust (Nomadacris septemfasciata Serv).

No swarms of this species occurred in the Union, South West Africa or the Bechuanaland Protectorate during the period under review.

Surveys during May and July, 1946 established the presence of solitary phase red locusts in Swaziland and the northern coastal belt of Natal. During the 1944-45 surveys none could be found and it is therefore not certain whether the locusts discovered in 1946 are the progeny of some that escaped detection during the previous surveys or whether their parents entered the Union in scattered formation during the 1945-46 season without being reported. A very small number of solitary-phase locusts were also found in some of the swampy areas of the Bechuanaland Protectorate in July 1946. Surveys will have to be continued to ascertain with certainty whether there are any potential outbreak centres of the red locust in the Union or Bechuanaland. The numbers of *solitaria* found in these latest surveys are very small and there is certainly no immediate threat, if any, to the Union from this source.

At Lake Rukwa, in Tanganyika, the International Red Locust Control Service carried out a successful campaign against an extensive incipient outbreak of this species. Although not yet a member of this Service, the Union contributed £10,000 and made available the services of an Entomologist and a Senior Locust Officer to assist in this valuable work. As a result of the large measure of success attained through this campaign, the beginnings of a new swarming cycle have been prevented and the Union need not fear a long series of invasions such as those experienced between 1933 and 1944. The experience gained during the last campaign at Lake Rukwa indicates that future incipient outbreaks can be controlled with equal success and there is now every hope that invasions of Southern Africa by red locust swarms can be entirely prevented in the future by this system of preventive control in the outbreak area of the species.

A few swarms of fliers, probably the tail-end of the last swarming cycle, have been reported from the southern parts of Angola during the past winter months. Although it is considered unlikely that these swarms will have sufficient momentum to invade the Union, it is hoped that the International Service will be in a position to attack their progeny and so remove any threat to Southern Africa from this source as well.

The expenditure incurred by magistrates in locust destruction amounted to approximately £5,000.

Research.

The practical approach to a large number of our problems must necessarily be effected through the medium of research and experimentation and, although striking results have been achieved in this field, there are still numerous problems awaiting elucidation and solution.

It is not by mere chance that the Department has founded some 20 research stations in various areas, but because it is deemed essential to investigate local problems locally. It is realized that this number of research stations is not sufficient for the investigation of all regional problems locally and last year a Committee was appointed to report on the desirability of erecting more strategically situated research stations. Besides these 20 stations, the 5 colleges of agriculture are also centres of research. It is intended to extend the research stations, but the rate of development is contingent on the availability of the necessary technical staff.

The research work of the Department is mainly concentrated on the production and the development of farming systems which are adapted to regional requirements. From its very nature it must cover a wide field and this work includes, *inter alia*, the cultivation and selection of plants which adapt themselves to specific climatic conditions, the development of veld and grazing practices for specific conditions, the determination of cultivation methods designed not only to maintain and improve soil fertility but also to increase the yield per unit of soil and, finally, the development of the right kind of animal, suited to the environment and best able to utilize the farm products economically. In addition to this we have the essential supplementary work in connection with livestock diseases, plant diseases and agricultural pests.

Full particulars in regard to the research and experimental work are given in the reports of the Divisions. This work covers the extensive field of agriculture in its entirety and includes much fundamental research calling for years of patient labour, before final results can be achieved.

The Department and the country can only express their gratitude towards the band of research workers—a group which unfortunately, is still all too small—who are straining every nerve to find a solution, along scientific lines, to the country's manifold problems.

Some universities also undertake agricultural research work on a limited scale, but there is still room for expansion and a closer relationship between the universities and the research activities and research stations of the Department, is exceedingly necessary. The research strength is so limited and the field so extensive that everyone capable of contributing his share, should be engaged in a concerted effort at tackling the problems besetting the agricultural industry.

Extension Work.

The extension service of the Department is steadily expanding, particular importance being attached to personal contact with the farming community. The aim is, as more qualified candidates are appointed, gradually to subdivide the area served by each extension officer into smaller units, since the present size of the various areas is not conducive to intensive service. The extension services constitute the means by which the Department popularizes the results of research and experimentation, and tested systems and practices, among individual farmers, and the task of maintaining the necessary contact devolves on the extension officer. The intention is that the farmer should find in the extension officer a true friend and adviser.

During the past year the extension officers devoted much of their time to co-operative demonstrations on private farms; these demonstrations proved a signal success and were invaluable not only to the farmer but also to the Department which obtains useful data through these sources.

The system of whole-farm demonstrations or demonstration farms, too, has expanded considerably and these demonstration farms are now to be found in 20 different regions. During the past year another 7 farms were used for demonstration purposes. Whereas co-operative demonstrations demonstrate certain aspects of farming only, the whole-farm demonstration is designed for the demonstration of a suitable farming system for the area in which the farm is situated. This is done with the full consent and collaboration of the owner.

In addition to the extension officers, the Department employs home-economics officers, who bring to our rural homes the benefit of their knowledge and experience. In many case they have already succeeded in arousing interest in those very things which make farm life happy and attractive. Theirs is the task of stimulating fresh interest in the housewife, as her interest contributes in no small measure towards the effecting of economy in household matters and the raising of the nutritional standards. The home-economics services constitute an integral part of the extension services for the country districts.

No less important than the services of the extension officers and home economics officers for maintaining personal contact, are the agricultural clubs and land service. The training of the youth to the realization that farming requires a high degree of skill, and the inculcation into the child and youth of a predilection for farming is perhaps one of the main steps which can be taken for stabilizing the agricultural industry of the future. Already these institutions have some remarkable achievements to their credit and they have often performed services in the interests of the whole community.

The Department also endeavours to establish contact with our farmers through the medium of the radio, the agricultural film service, the facilities offered by the agricultural library, the press service, the agricultural bulletins and the monthly publication, *Farming in South Africa*. The radio is an innovation in the field of agricultural education but proved very popular during the war years. Up to April 1946 only three talks were delivered weekly, but in collaboration with the South African Broadcasting Corporation, a better arrangement has been made, and agricultural items are now broadcast at a more suitable hour. No longer are they limited to the somewhat dry talks of yore, but the information is now presented more attractively and includes conversations, interviews, etc.

Education.

It has already been stated that farming, with its numerous problems, is gradually making heavier demands on those who practise it and that agricultural education is, for that reason, of the utmost importance to the agricultural industry.

The agricultural faculties of the universities of Stellenbosch and Pretoria and the 5 colleges of agriculture are offering a service in this respect which cannot be valued too highly. The creation of a faculty of agriculture at the Natal University College in Pietermaritzburg, which has already been decided upon, is being awaited with interest and will be another milestone in the establishment of facilities for agricultural education.

The faculties are the institutions whose task it is to satisfy the ever-increasing demand for qualified agriculturists for all the branches of the agricultural industry; the colleges of agriculture, on the other

hand, supply those trained farmers, who are so essential to the agricultural industry which has to satisfy growing demands, and which, in turn, is ever making heavier demands on farmers. The colleges of agriculture also produce trained persons who are capable of acting as foremen on farms and who are also qualified for appointment as managers in creameries and cheese factories as well as in other capacities. These colleges have already made their mark, and some of their old students are to-day occupying important posts, while others are playing leading rôles as progressive farmers.

The post-war reintroduction of the diploma course, other regular courses and special short courses at the colleges of agriculture at the beginning of 1945 is an event of national importance and the number of enrolments testify to the present need for this type of training and the popularity of the various courses. There was a time when the colleges of agriculture failed to draw sufficient numbers of students and, although the number of registrations has gradually increased since the introduction of the Two-year Diploma Course before the war, 1946 is the first year in which the colleges were compelled to refuse applicants admission.

In enrolling students for 1946, preference was given to ex-volunteers, and in all cases the maximum number was accepted, and no Union ex-volunteers in possession of the necessary qualifications were refused admission. All vacancies at Cedara for both 1946 and 1947 have been booked by ex-volunteers.

Since our colleges of agriculture in the Union offer courses which, to some extent, are also adapted to conditions prevailing in the adjoining territories they are also the obvious institutions upon which those territories have to rely for the agricultural training of their citizens. Consequently, facilities have been created for the admission of a limited number of students from these territories to courses offered by the Colleges.

Personnel.

From this report as well as the Divisional reports, it can be seen that the shortage of staff, mainly of professional officers, had a hampering effect on the extensive activities of the Department, in some cases even to such an extent, that certain research activities either had to be temporarily discontinued, or cut down. Since the agricultural industry is continuously waging war against the multiplicity of stock diseases, insect pests, and plant diseases, and is ever endeavouring to solve production problems the question of an adequate and well-equipped staff is a matter of the outmost importance.

The number of qualified candidates offering their services is entirely inadequate to satisfy the abnormal demand from both the state and private employers and, although the Department is making every effort to establish better facilities for the training of agriculturists, there is not much hope for any considerable improvement in the position in the near future.

Agricultural Research for Greater Production.

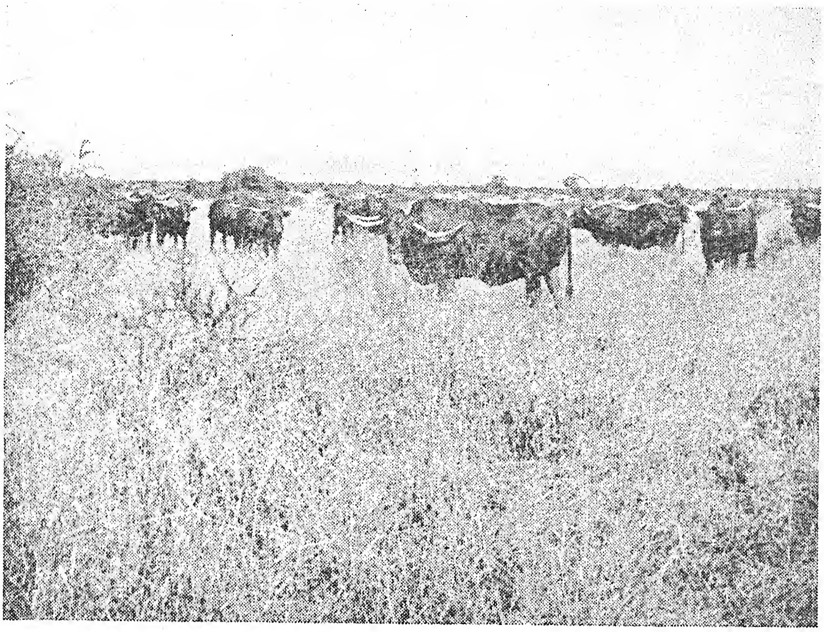
For victor and vanquished alike the termination of hostilities has brought little or no relief in so far as food supplies are concerned.

South Africa is no exception and the position in our country is such that it has been found necessary to call into being a Directorate of Food Supplies and Distribution, whose function it is to ensure that the limited supplies of many of our essential foods are so distributed that every person—no matter what his financial position—receives a fair share of the commodities in short supply.

It is not only in total quantities or calories that there is a lack, but also in the quality of the food, for our nutrition scientists are adding almost daily to the lists of essentials for an adequate diet that must be provided for a reasonable standard of health.

The result is that those concerned with the production of food, our farmers, are being called upon not only to provide the calories in the form of more cereals, like maize and wheat, but also more of the so-called protective foods which contain the vitamins, the minerals and the proteins essential to health.

Furthermore, the position in regard to food has assumed a new aspect as a result of the acceptance by practically all nations of social



Farm in harmony with Nature. Beef cattle on well-preserved veld in northern Transvaal.

security plans which not only envisage better housing, fuller employment and better wages, but also better health and better living standards. Emphasis is being laid, too, on preventive medicine. All these will stimulate the demand for food, particularly for the protective and concentrate foods such as fruit and vegetables, dairy products, meat and eggs, and the fundamental problem is how to provide these in sufficient quantity.

The discovery in the Orange Free State of new gold fields rivalling those of the Rand and the industrial expansion that is evident on every hand will make still further demands on our farmers for food.

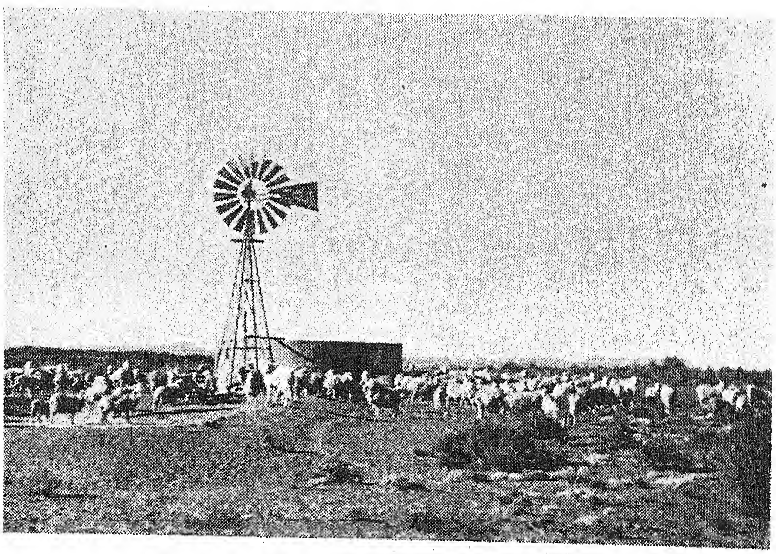
It may seem strange, but it is nevertheless true that every fresh demand for protective foods results in an increased drain on our principal cereal crop, maize, already the staple food of our native population. If we are to answer this call for more and better quality food, then special attention must be given to increased maize production.

Only about 15 per cent. of the land area of the Union is suitable for arable purposes. This is the area on which we must rely for the production of cereal and other crops to supply the nation's calories, for both man and beast. The importance of the conservation and proper utilization of this area cannot be over-stressed. But animal products, particularly meat and milk, are also derived to a considerable extent from our veld, comprising about 85 per cent. of our land area, while much of the other protective foods, such as fruit and vegeables, come from our very restricted irrigation areas.

Were all our land areas intact, we might look with greater equanimity on the problem of food production, but unfortunately much of our most valuable veld is scarred, eroded and denuded so that productivity is reduced and restoration will be a long and arduous task. Similarly, some of our best arable land has through injudicious use become depleted of its fertility, weedy and sadly damaged as a result of wind and water erosion.

Even in some of our priceless irrigation lands, brak and water loggings are offering a threat which cannot go unheeded.

It is the task of the Department to solve those difficulties, to restore the veld to its original state of productivity, to ensure that the maximum yield of cereals, particularly of maize, is obtained from our limited areas of good arable land by devising methods that will maintain, or better still, improve, the productivity of the soil, to utilize the irrigation lands so as to obtain the maximum of production and to adopt methods that will prevent deterioration of these lands and finally to make such use of the veld and of the arable land that the *needs* of *all* our people for an abundance of food of good quality will be assured.



Many thousands of these circular reservoirs have been built under the Soil Erosion Scheme.

II. Principal Agricultural Products.

A.—Food Products.

FOOD is one of the essential necessaries of life of all sections of the community, and is indispensable to the survival of the nation. This fact emerged all too clearly during the past year, which will be remembered as a year of crisis in the sphere of food in this country. The heaviest demands were made on our agricultural industry at a time when weather conditions were the most trying ever experienced by our farming community. A short discussion of our most important food products will therefore be appropriate.

Maize.

The 1945/46 Maize Season.

The 1945-46 maize season commenced with an estimated yield of approximately 18,000,000 bags. Since, in view of the more scattered nature of the crop, deliveries were expected to be much smaller than would have been the case with a more or less similar yield in the previous season, it was clear from the very start that the country would be hard put to it to meet the needs of the population until the next crop would be available. The utmost degree of economy was therefore essential from the very outset, and in these circumstances it was evident that full control would be necessary more than ever before since; without such control, it would have been impossible to regulate distributon equitably or to secure supplies for the whole season, in spite of the permit system. Full control was therefore again assumed by the Mealie Industry Control Board who, from the beginning of the season, undertook all purchases except those comprising small quantities for local consumption.

Control and Compensation to Agents. — In order to render physical control possible, the Union was again, as in the 1944-45 season, divided into two areas, namely, Area A, consisting of the producing areas of the Transvaal, the Orange Free State and the magisterial districts of Vryburg and Mafeking, and Area B, comprising the remainder of the Union. In the first-mentioned area the Board operated as the sole buyer of maize from producers, through the medium of agents, while dealers registered with the Board, who brought maize on their own account, performed this function in Area B.

As during the 1944-45 season, the compensation to agents was fixed at 5d. per bag, to cover handling and storage costs for a maximum of 1 month, but storage fees were subsequently increased by 2d. to 2½d. per bag in order to cover labour and other costs. On account of the poor harvest, the estimated flow of maize to and from the stores of agents could not be maintained, and those agents who had to rely on the storage compensation of 2½d. per bag per month, if they were not to show a loss on the handling of maize, found that the compensation was inadequate for defraying their costs. Consequently, the matter was considered by the Board and increased compensation awarded to agents.

Prices.—The price of 19s. per bag for the 1945-46 season was fixed after consultation and thorough consideration of all the aspects of the case. Of this amount the Government contributes 2s. 6d. per bag by way of a subsidy, so that the basic price on which consumers' prices rest, amounts to 16s. 6d. per bag instead of 16s. per bag as during the previous two seasons. Handling and storage costs,

however, also show an increase, mainly on account of increases in labour costs and the expected smaller sales, and consequently the selling prices had to be increased proportionately by 1d. per bag above those of the last season. The selling prices of the Board thus range from 17s. 8d. to 19s. 2d. per bag for the best grades, depending on the quantity, which has to be sold at a time. The latter amount also represents the maximum sale price in the trade. One change which has been effected, was again to include grade 4 maize under the best grades as during 1943-44. For loose maize in quantities of less than 200 lb. the price was fixed at 1d. per lb.

No change was made in respect of the variation in the prices of maize products, and the prices of the various classes of products were therefore fixed as follows:—

	Millers' Price Per Bag.	Distributors' Price Per Bag.
	s. d.	s. d.
Fine granulated mealiemeal	19 8	21 2
Unsifted granulated mealiemeal	19 4	20 10
Other unsifted mealiemeal	18 11	20 5
Sifted crushed maize	19 5	20 11
Unsifted crushed maize	18 11	20 5
Samp	24 9	26 3
Mealie rice	24 9	26 3
Maize germ meal	11 9	13 3
Hominy chop	10 3	11 9
Maize bran	6 3	7 9

Equalization levy.—In order to place distributors in Natal and the Cape Province, with the exception of the districts of Vryburg and Mafeking, in the same position as those in the rest of the Union, an equalization levy of 8d. per bag was imposed on all maize acquired by registered dealers in the first-mentioned areas. This amount represents the difference between the basic figure at which selling prices are fixed and the price at which the Board sells wholesale quantities of maize. The same levy was also payable on bran retained by millers where they had milled maize on behalf of their clients. With the prohibition of the sifting of mealiemeal, however, this levy, in so far as it affected bran, became inoperative.

Supplementary payment of 6d.—Difficulties in connection with the provision of maize presented themselves even before the season had commenced. The supplies of the old season were practically exhausted and the quantities which were still held available, were concentrated at a few co-operative dépôts. These dépôts therefore had to satisfy all demands, which naturally was an enormous task, and moreover, railway facilities could not always be provided without delay.

Eventually it once again became necessary to take special steps for furnishing adequate supplies for immediate consumption and an appeal was made to producers to expedite early deliveries and, in addition, a premium of 6d. per bag was offered on all deliveries up to 9 June 1945. It was also announced that agents of the Board could at their own discretion, take in maize with a moisture content as high as 15 per cent., subject, of course, to a calculation of weight on a basis of 12½ per cent. moisture. This step had the desired effect and the Board was enabled to procure the necessary supplies in good time.

Payments to Agents.—Another problem which arose was that of immediately transporting those supplies which had been delivered by producers to the mills, in order that the latter could be kept going. Delays occurred owing to the fact that the Board did not receive immediate notification of deliveries, and also did not have sufficient supplies available apart from the deliveries for immediate supply. Consequently arrangements were made enabling millers, subject to the previous consent of the Board, to take over maize direct from agents who had supplied them in the past, and the parties made their own arrangements in regard to payment for the quantities delivered.

Storage.—In spite of the short crop, the old problem arose again at first, and already early in the season larger quantities of maize had accumulated at certain posts than could be brought under cover, but this time it caused no concern, for the Board was in a position through direct control to make timely arrangements for bringing the maize stacked in the open into distribution. Provision had, however, again to be made for bucksails to cover the maize stacked in the open for the time being until such time as it could be shifted.

Rationing and economy measures.—In order to make available local supplies of maize last as long as possible, drastic changes in the rationing system were unavoidable. In so far at it was possible it was endeavoured to introduce the curtailments by degrees and to warn consumers in advance, but nevertheless, the latter felt the restrictions keenly, coinciding as they did with the most severe drought conditions. Reductions were made especially in the quantities made available for stock feed and manufacturing purposes.

Steps have been taken to establish local committees in the principal native areas to regulate the distribution of the available supplies among dealers and to supervise the sale thereof. At that time there already existed a general committee for the Transkei as a whole, and a number of regional committees have now been established in the Ciskei and Zululand as well as in the northern Transvaal native areas. The assistance of these committees contributed in a large measure to a more uniform distribution of maize and maize products amongst consumers.

Other measures for curtailing consumption, consist of a reduction of permit-free purchase in the larger urban areas where other foodstuffs which can be substituted for maize are more easily obtainable and a prohibition on the manufacture of sifted mealiemeal, samp and mealie rice. The prohibition on the latter two products was also designed to curtail the consumption in the case of persons who are in a position to obtain other foods, since these products are consumed mainly by Europeans, and perhaps, in a lesser degree also by non-Europeans, in urban areas.

Owing to the short crop as a result of the drought in those areas where production consists mainly of white maize and the consequent disparity between the supplies of yellow maize and those of white maize, it was found necessary to impose a prohibition on the manufacture of mealiemeal exclusively from white maize. The manufacture of crushed maize, except from yellow maize only was also prohibited. The quantity of yellow mealiemeal which had to be incorporated was initially fixed at 20 per cent. but in the course of time had to be raised to 60 per cent., first because the available supplies of maize were petering out and secondly, because the imported maize consisted mainly of the yellow variety.

As regards the manufacture of unsifted mealiemeal, it should further be pointed out that the prohibition was partially lifted later in the season and the removal of 7½ per cent. of bran and other waste products was permitted in the case of maize milled for producers.

This step was deemed necessary because of the fact that the smaller mills which mill mainly for producers, were not in a position to process the bran in such a way that the mealiemeal could be used for human consumption.

Importation.—In spite of the steps taken for curtailing the consumption of maize as far as possible in an endeavour to make available supplies last out until the end of the season, it was evident that, in addition to the relatively small supplies already imported from neighbouring territories, it would be necessary to import further quantities from overseas. Consequently, later in the season and as shipping space became available, maize was imported from the Argentine in exchange for South African coal. The purchases were made by the Department, but arrangements for the importation and distribution as well as for the purchase and dispatch of the coal were undertaken by the Board. By way of compensation the Board received a commission of 1d. per bag from the State on the landed maize.

The prices for imported maize are considerably higher than those fixed for the locally-produced commodity, but the difference in price was subsidized by the State in order to maintain the prevailing consumer's prices.

Up to and including 13 April 1946, a quantity of 1,354,292 bags reached the Union from the Argentine, while 526,040 bags were imported from the adjoining territories.

The 1946/47 Season.

This season commenced with a crop estimate equivalent to that of the previous season, but with the harvesting of the crops, it was found that the quantities delivered by producers to the Mealie Industry Control Board were less than those of last year with a crop of about the same dimensions. The carry-over of the 1945-46 season was extremely small and in these circumstances, it was found necessary to exercise the utmost economy and to continue rationing on the same basis.

Consequently, as in the previous two seasons, full physical control had to be applied. The Board, through its agents, was again the sole buyer of maize from producers in Area A, while dealers in Area B were registered for this purpose. Agents again received compensation in respect of handling and storage on the same basis as during the previous season.

Prices.—With a view to encouraging maximum production, the Government agreed to fix the producers' price for this season at 22s. 6d. per bag for the best grades and to announce a guaranteed price of 20s. per bag for the subsequent season. For elevator maize the price was fixed at 1s. 4d. per bag and for loose maize at 2s. per bag lower, whereas the price for quantities less than 200 lb. was fixed at 1s. 8d. per lb. Seed-maize prices were fixed at a minimum price of 26s. 6d. per bag. To reduce the price to the consumer the Government contributes 5s. per bag by way of a subsidy, so that the basic price, on which consumers' prices rest amounts to 17s. 6d. per bag. The maximum consumers' price, as compared with the prices of the previous season, increased by 1s. per bag and is at present 20s. 2d. per bag for the best grade, whereas the prices at which the Board sells, range from 18s. 8d. to 20s. 2d. per bag for the best grade, according to the quantity purchased at a time.

The prices of maize products have, with due regard to the changes effected in the margin allowed to millers, been fixed as follows:—

	Millers' Price Per Bag.	Distributors' Price Per Bag.
	s. d.	s. d.
Unsifted granulated mealiemeal	20 4	21 10
Unsifted mealiemeal other than unsifted granulated mealiemeal	19 11	21 5
Sifted crushed maize	20 5	21 11
Unsifted crushed maize	19 11	21 5
Maize flour	25 9	27 3
Bakers' Cones	25 9	27 3
Mealie rice	25 9	27 3
Germ meal	12 6	14 0
Hominy chop	11 0	12 6
Maize samp (fine or crude)	6 9	8 3
Maize feed	6 9	8 3

The conditions which obtained during the previous season with regard to prices, e.g. in connection with transport costs and railage, sales in small parcels, increases in price in case of credit sales, etc., were again applicable this season. The equalization levy on purchases by dealers from producers in Natal and the Cape Province, excluding the districts of Vryburg and Mafeking, also remained the same and was again, as in the previous season fixed at 8d. per bag.

Millers' levy.—The levy imposed on all maize which is milled, crushed, or otherwise processed, was increased from ¾d. to 4d. per 200 lb. This increase was necessary because the Board had to obtain additional funds for defraying the increased compensation to agents and other costs and the amount required could not be drawn from the margin between the purchasing prices and selling prices allowed to the Board. Another source of income therefore had to be found, and in the circumstances it was decided to increase the levy on milling. This levy is paid by all millers and the exemption previously granted to producers has been discontinued.

The increase in the levy, however, did not induce an increase in the price of maize products, since the margin allowed the millers was such that the increased levy, after a review of the margin, could be recovered from the latter. It was found that various circumstances justified a decrease in the existing margin; for example, in computing the original margin, provision had been made for the storage of maize for the milling requirements of two months, whereas millers actually only kept sufficient stocks for two weeks. Consequently, a decrease in the amount of interest originally allowed, could be effected. In addition, the prices of maize and maize products for the new season (1946-47) were increased by 1s. per bag. Whereas in the case of maize the increase amounted to 1s. per 200 lb., it was 1s. per 100 lb. in the case of mealiemeal and crushed maize, and this brought about an increase in the margin allowed to millers which could therefore be reduced by the relative amount. Finally it was found that with the elimination of sifted mealiemeal, the loss in weight during the milling process could be reduced by ½d. per bag and that this value could also be taken into account on reviewing the margin.

Storage.—As in the previous season, the storage problem gave rise to concern this season too. The position was, however, aggravated by the serious shortage of grain bags, which induced producers to deliver more maize to the elevators than was originally expected, and also as a result of the large quantities of imported maize delivered

in bulk. Consequently, less elevator space was available for the imported maize than had originally been expected and serious difficulties were experienced in connection with the storage of that supply of maize which was landed in bulk at the Union docks. Moreover, all the locally produced maize could not be brought under cover and consequently had to be stacked in the open, with the attendant risk of damage. Stacking in the open had naturally to be avoided as far as possible, and in these circumstances, consideration was given to the maximum storage at maize mills. The millers were agreeable, but intimated that they would not be in a position to finance the exceptionally heavy purchases thus induced. By way of compromise, it was therefore decided that payment would not be expected from millers directly upon receipt of the maize, but that they would be allowed to pay for stocks as they required them. Since the Board was compelled to pay its agents within 7 days of dispatch, and did not have the necessary funds at its disposal, it negotiated a loan from the Reserve Bank, in order to create the necessary credit facilities for millers. To obtain further storage space it was decided to approach in addition to millers, all co-operative societies and consumers' associations, with the request that they buy stocks for 3 to 6 months in advance, for later distribution amongst consumers, against permits.

As a result of the larger deposits of maize in elevators, it was also found that the loan of £500,000 contracted with the Land Bank earlier in the season would be inadequate for covering all elevator purchases, and in these circumstances a further loan of £5,000 became necessary.

Rationing and Importation.

In view of the serious shortage of all foods, a Directorate of Food Supplies and Distribution was instituted in an endeavour to cope with the position and, in the case of maize, to undertake the rationing of the commodity but as in the past, the Board in consultation with the Director remains responsible for the administration of the rationing of the cereal.

As has been pointed out, as early as the beginning of the season it was clear that the crop would not satisfy the country's requirements and, with a view to supplementing supplies, an endeavour was made to obtain maize from outside the Union. The arrangements made during the previous season in connection with the importation of maize from the Argentine were continued, and until 31 August 1946 a supply of 1,082,287 bags was landed at the Union docks. An amount of 85,233 bags was received from adjoining territories.

Mealie Rice and Samp.

In spite of the additional supplies of maize imported, the stock position remains difficult, and it is clear that unless climatic conditions improve, further reductions of existing grants may be inevitable. In an endeavour to ameliorate the food position generally, the prohibition of the processing of mealie rice and samp has been lifted. The manufacture of these products was originally prohibited with a view to husbanding available supplies and also making more mealiemeal available for natives.

Threshing Fees and Milling Costs.

As a result of representations received from threshing-machine owners for an increase in the existing threshing fees, a thorough investigation into the existing threshing costs was instituted by the

Mealie Industry Control Board. The findings were such, however, that an increase of the prices fixed in 1934, namely 6d. per bag of 200 lb. net in the case of unhusked ears and 4d. per bag of 200 lb. in the case of husked ears could not be justified in these circumstances. No change has been effected in this connection.

In the past, representations were received from time to time from producers, in connection with the milling fees of rural millers, and objections were raised in particular, to the practice of millers of not returning the full weight of the products obtained from a bag of maize, but retaining a percentage thereof. This percentage is then regarded as part payment for the services rendered, so that, should it be surrendered to the producer, the milling fee would have to be increased accordingly. This practice however, causes much dissatisfaction, and in these circumstances, an investigation was instituted into the milling costs of rural mills with a view to fixing the final milling fees. It appeared however, that the milling costs were by no means constant and differed from mill to mill. The differences are, however, so big that in the very nature of the case, it would be impracticable and well-nigh impossible to prescribe uniform milling fees, and consequently, it has been decided not to effect any change in the existing position.

Seed.

With a view to increasing maize production, the Mealie Industry Control Board has instituted a seed scheme, designed to make suitable seed available to producers. In pursuance of the scheme, maize which has been tested and found suitable for seed is separated in the packhouses of certain agents for supplying producers later, and maize sold by seedsmen must be accompanied by a certificate to the effect that the maize concerned is suitable for seed.

The production per morgen in South Africa is at present relatively low and, in an endeavour to increase it, efforts are also being made, irrespective of the seed scheme, to breed hybrid maize, which is giving such outstanding results in the U.S.A., in the Union too. Experiments in this connection are already under way at the Potchefstroom College of Agriculture, but these tests are still in the embryonic stage. The development is being awaited with interest.

Kaffircorn.

As is known, the Mealie Industry Control Board also undertook control of kaffircorn during the 1945-46 season.

Initially, permit-free sales of kaffircorn and malt were allowed up to a maximum quantity of 200 lb. per person per month, but later, as a result of the deterioration in the stock position, the quantities were reduced to 50 lb. in the case of kaffircorn and 25 lb. in the case of malt. The position, however, showed a progressive deterioration, and with a view to maintaining certain essential services, allocations were made from October 1945, in addition to the relatively small supplies of kaffircorn set aside for breakfast and infant foods, for the processing of malt for use by the large employers and municipal beer halls only. No malt could be placed at the disposal of other persons and consequently permit-free sales were prohibited entirely. Persons who still had malt in stock, however, were given an opportunity of disposing thereof within a definite period in maximum quantities of 25 lb. per person.

As the new season drew nearer, it became evident that in view of the drought the next kaffircorn crop would also be poor. Greater difficulties than those experienced during the previous season could therefore be expected if control were to be continued and consequently it was decided not to exercise control over kaffircorn during the coming season. The relative regulation was thus revoked on 26 April 1946 and the kaffircorn trade was once again left to the law of supply and demand.

The Mealie Industry Control Board, as the sole buyer of kaffircorn from producers, still had certain supplies on hand with agents, however, at the time of the abolition of control. These supplies were disposed of at ruling market prices which, after the abolition of control, went up by leaps and bounds and the yield, after deduction of the purchasing price and the margin allowed to the Board, will be paid to producers in proportion to their supplies to the Board. The amount available for final distribution is £9,340 and the Board will start making disbursements shortly.

Winter Cereals.

(a) Wheat.

According to the official final estimate the 1945-46 crop would have amounted to 3,400,000 bags, but the actual production was considerably lower than this figure, and the Wheat Industry Control Board received threshing-machine returns, which placed the figure at 2,806,523 bags only. Thus, the crop was even smaller than the particularly poor crop of the previous season, due mainly to the exceptionally small yield of the Orange Free State. The Transvaal crop, too, was disappointing, and the failure of the crop in the north-eastern Cape Province thus reduced the figure for the Cape Province. The following data (threshing-machine returns) for the past four seasons will, however, elucidate the position.

Province.	Bags per 200 lb. net.			
	Season 1942/43	Season 1943/44	Season 1944/45	Season 1945/46
Cape Province..	2,797,027	2,707,463	2,626,780	2,168,563
Transvall...	774,851	842,956	484,017	419,909
Orange Free State.....	2,585,307	1,784,638	263,352	218,060
Natal.......	989	837	53	—
Total for Union....	6,158,174	5,335,894	3,374,202	2,806,532

The decrease in the crop of the Cape Province must be ascribed to unfavourable climatic conditions, excessive rains in the western, and drought in the north-eastern areas. The poor crop of the Transvaal and the crop failure of the Orange Free State are due to severe drought conditions.

This small crop, which covered less than half the country's requirements, immediately created a most serious position which was much worse than would appear from a comparison of the crop with that of the previous year. The 1944-45 season commenced with a

considerable reserve in the form of a carry-over of 2,304,436 bags on 30 September 1944. The reserve had been built up with great difficulty during the previous years. It was, however, used up during the 1944-45 season and, as a result, the carry-over on 30 September 1944 amounted to only 733,669 bags—less than a two-months' supply. To make matters worse the demand for bread showed an enormous increase as a result of the strict rationing of maize, especially in those areas carrying a large native population who had replaced mealie-meal by bread. On the Witwatersrand, for example, bread consumption during January, February and March 1946 showed an increase of 47 per cent., 43 per cent., and 31 per cent. as compared with the same months during the previous year. In the Cape Peninsula, where the native population is smaller in proportion, the consumption for these months showed an increase of 9 per cent., 11 per cent., and 14 per cent. only. The demand for meal, and consequently also the consumption of wheat, increased proportionately. As a result of the disappearance of the reserve, the poor crop and the increase in consumption, the Union had to import wheat on a scale unprecedented in its history. According to estimates the Union had to import 3,500,000 bags during the 1945-46 season—2,500,000 bags during the first and 1,000,000 bags during the latter half of the year.

Unfortunately, the shortage of fertilizer and the general dislocation resulting from the war in Europe, the poor crops in North Africa and the poor rice crops in the Far East due to the war there, induced a very serious world shortage of wheat. This shortage is estimated at 80,000,000 bags. As a result, the allocation to the Union through the Combined Food Board (superceded in 1946 by the International Food Board) was drastically curtailed. The allocation for the first half was 170,000 tons or 1,900,000 bags only. The position was further aggravated by the fact that the Union was compelled to accept a considerable quantity of the allocation in the form of flour of 72 per cent. extraction, which means that 72 lb. of flour calculated at the rate of allocation, is equal to 100 lb. of wheat. This means further that, instead of 100 lb. of wheat which yields 96 lb. of meal, the Union obtained 72 lb. of flour only and, in addition, this allocation was further reduced by 24 per cent. in respect of the quantity of flour delivered at the rate of allocation.

Up to 31 August, 1946, 1,435,250 bags of wheat, 545,031 bags of flour and 23,340 bags of meal were imported. The flour was mixed with wheaten meal from which no bran had been removed, and made available for bread. Apart from this, the carry-over, together with the crop, was so small that the wheat requirements of the Union could be satisfied until April 1946 only. As a result of transport difficulties in Canada and the fact that the mouth of the St. Lawrence river was frozen during the winter months, the wheat allocated could not immediately be dispatched. The result was that the wheat stocks in the Union were practically exhausted before the arrival of the imported wheat and flour. Nor did the wheat arrive soon enough to ensure any appreciable improvement in the position and, consequently, the country had to live from hand to mouth. With great difficulty the country succeeded however, in distributing the supply throughout the period in such a manner that no part of the country was at any time without meal or bread, although at times the supplies in some large centres covered less than a week's requirements.

As early as December 1945, it was clear that the wheat position would be very unfavourable. Consequently it was decided, as from 1 January 1946 to prohibit the use of unsifted wheaten meal No. 1 for confectionery and biscuits, and the use of rye flour for cake was

considerably larger than that of the previous season, especially in the Orange Free State.

It is, however, necessary to sound a note of warning against the danger of exaggerated optimism. Even if the most sanguine expectations are realized, it is clear that it will still be necessary to import wheat. Moreover, it should be pointed out that, although the export countries of the northern hemisphere have harvested exceptionally good crops, the northern season commenced with a carry-over which was significantly smaller than that of which they could boast the previous season. In addition, the estimated production in the principal importing countries has by no means reached the normal figure. A further factor to be taken into account, is that the hope which had been generally cherished that the shipping position would improve considerably, has so far not materialized and this factor will in all probability continue to cause concern in 1946-47. The Union will therefore have to continue with the standard loaf in 1946-47 and, although some of the measures introduced in 1946 will probably be relaxed during the new year, the Union will still have to keep a vigilant eye on her wheat supplies.

(b) Other Winter Cereals.*

As stated in previous reports, the control of barley, oats and rye has since November 1942, been entrusted to the Wheat Industry Control Board. In terms of the measure conferring this authority, producers are prohibited from delivering barley, oats and rye to persons other than the Board. The Minister determines the grades and the purchasing and selling prices of these cereals as also the grades for rye flour, rye meal and rye bread. The selling prices of these rye products are fixed by the Board, subject to the Minister's approval. The grades for barley, oats and rye and rye flour, rye meal and rye bread were fixed by Government Notice No. 2377 of 20 November 1942 and revised from time to time. During the 1945-46 season grades and prices were also fixed for crushed oats and ground oats. (Government Notices Nos. 2615 and 2616 of 28 December 1945). The manufacture of rye flour and rye meal is subject to a permit issued by the Wheat Industry Control Board. Oat hay is not controlled, except that the maximum selling prices are fixed by the Price Controller as are also those of cut oat hay.

In so far as barley, oats and rye are concerned, the past season must just as in the case of wheat, be viewed against a background of shortages, rations and imports.

Barley.

The producers' prices for 1945-46 were as follows:—

Class A, first grade (six-row malted barley) 21s. per bag of 150 lb., net.

Class B, first grade (two-row malted barley) 20s. per bag of 150 lb., net.

Class C, first grade (feed barley) 12s. 7d. per bag of 150 lb., net.

Class D, first grade (barley-wheat) 22s. 6d. per bag of 200 lb., net.

The prices of the lower grades of the respective classes were fixed in proportion. It will be observed that, with the exception of feed barley, the prices were the same as those for the previous season.

* To illustrate seasonal tendencies, the statistics are given in some cases up to 31st October, 1946

It was realized that the price of feed barley should be fixed in relation to the price of other feeds more particularly maize, and its feeding value did not justify a price in excess of 12s. 7d. per bag. The basic selling prices for purposes other than those of feeding and seed were the above prices, plus 7d. per bag for classes A and B (of which 5d. covers the agent's commission and 2d. the Wheat Board's commission) and 9d. per bag for Class D (of which 6d. covers the agent's commission and 3d. the Board's commission). In the case of Class C where the crop was *not* sold as a feed or seed, the basic selling price was 16s. 1d. per bag of 150 lb. net. The difference between the selling and the purchasing price was therefore 3s. 6d. of which 7d. covered the agent's and Board's commission and the remaining 2s. 11d. per bag was intended for partially supplementing the loss which resulted, first because it had been found necessary in 1944-45 to shift barley from the south-western Cape Province to the elevators in order to avoid weevil damage and secondly, because the price of feed barley was reduced by 1s. 7d. per bag as from 1 May, 1945. This reduction was explained in the previous report. Where barley was sold for seed and fodder, the selling prices amounted to the purchasing prices plus 7d. for Classes A and B and plus 9d. for Class D, by way of covering the agent's and Board's commission, and for Class C the purchase price plus 1s. 11d., of which 7d. covered the agent's and Board's commission and 1s. 4d. was intended as a contribution towards covering the losses already mentioned.

The following quantities of barley were purchased during the year under review (A, B and C in bags of 150 lb. net and D in bags of 200 lb. net.) The receipts for 1944-45 are also given:—

	1945-46 *in bags*	1944-45 *in bags*
Class A	73,205	140,850
Class B	15,009	25,938
Class C	179,733	281,220
Class D	415	905
TOTAL	268,362	448,913

It will be observed that the purchases in 1945-46 amounted to about 180,000 bags less than those for 1944-45. The estimated requirements were as follows:—

Purpose.	Requirements Estimated.	Sales 1944/45.
	In Bags.	In Bags.
Seed	30,000	29,071
Feed	186,400	185,456
Beer	190,000	184,843
Yeast	16,300	*20,114
Pearl Barley	49,300	34,093
TOTAL	472,000	453,577

* Including Malt.

It is thus clear that there was a serious shortage of barley. The crop estimates pointed to a particularly poor crop and for this reason it was decided to allow liberal quantities of barley for seed, pearl barley and yeast, to satisfy the requirements for beer to a limited

extent, and to ration barley as animal feed from the beginning of the season. It soon became evident however, that the crop was even poorer than the indications of the estimates, and from December 1945 up to the end of August 1946, no further supplies of barley were released as animal feed. Subsequent imported barley was again released for this purpose. In view of the general scarcity of cereals in the country, it was decided to import 150,000 bags of barley, of which 115,042 bags were imported up to 31 October, 1946. In those cases, where imported barley was sold for feed purposes, the price was the same as for local feed barley.

Up to 31 October, 1946 the following quantities of locally-grown and imported barley were sold for the purposes indicated:—

Seed (locally-grown barley only)	51,343 bags.
Feed, locally-grown barley	45,178 bags.
imported barley	36,870 bags.
Yeast and malt, locally-grown barley	17,075 bags.
Pear barley, locally-grown barley	65,381 bags.
Beer, locally-grown barley	90,507 bags.
imported barley	25,528 bags.
Miscellaneous	116 bags.
TOTAL	332,043 bags.

From the above figures it will be seen that the seed sales exceeded the estimated requirements by 21,000 bags—the estimated requirements being based on the sales of the previous season. The sales in respect of yeast and pearl barley were also considerably higher than those for the previous season. Later in the report further reference will be made to the figures.

Oats.

During the 1945-46 season the oats prices to producers were as follows:—

Class A, first grade: 13s. 1d. per bag of 150 lb. net.
Class B, first grade: 12s. 7d. per bag of 150 lb. net.
The prices of the lower grades were fixed in proportion.

Thus, the prices were lower than those which obtained for the 1944-45 season, namely 16s. and 15s. 6d. per bag respectively. The reason for the lower prices is that it was felt that, as in the case of feed barley, the price of oats should be based on the feeding value of the cereal in comparison with the feeding value and price of maize.

For oats bought from the Board for purposes other than seed or feeds, the basic selling prices were 17s. 5d. and 16s. 11d. per bag for Class A, first grade, and Class B, first grade, respectively. Of the difference, the amount of 7d. per bag was intended for covering the agent's and Board's Commission (5d. and 2d. per bag respectively,) and 3s. 9d. for covering the following losses:—

(*a*) losses sustained on 332,000 bags of oats sold from 1 May, 1945 at a lower price for feed;
(*b*) storage costs on 280,000 bags of oats as from 1 April, 1945 up to 31 October, 1945;
(*c*) storage costs on 280,000 bags of oats subsequent to 31 October, 1945;
(*d*) the loss on carry-over at the close of 1944-45 as a result of a fall in price from 15s. 6d. to 12s. 7d.; and
(*e*) cost of storage of 90,000 bags in elevators in order to prevent weevil infestation.

As in the case of feed barley, the basic selling prices of oats for seed purposes and feeds, were 1s. 11d. per bag higher than the

purchasing price. Of this amount, 7d. represented the agent's and Board's commission and 1s. 4d. was intended for covering the above-mentioned losses.

Already at the beginning of the 1945-46 season it was evident that the carry-over plus the new crop would be totally inadequate for satisfying the demand for seed, oats for human consumption and stock feeds. The following are the quantities of locally-grown oats purchased during the period under review as against purchases during the 1944-45 season (bags of 150 lb. net):—

	1945/46.	1944/45.
	Bags.	Bags.
South-western Cape Province	459,879	612,157
Remainder of Cape Province	624	13,532
Orange Free State	2,685	277,238
Transvaal	2,971	71,995
TOTAL	466,159	974,922

The shortage, as compared with that of the previous season, is clearly reflected in the above figures. The position was further aggravated by the serious shortage of maize, with the result that an unprecedented demand arose for oats as an animal feed, as seed for a cereal crop and as a green feed. In addition, the demand for oats for human consumption was considerably stimulated by the serious shortage of wheat in the country. From December 1945 up to end of the period under review, oats as an animal feed was rationed. In view of the general stortage of animal feed in the country it was decided to authorize the Wheat Industry Control Board to import 1,650,000 bags of oats, of which 1,387,088 bags were received to 31 October, 1946. Owing to a delay in the shipping of the oats which had been purchased overseas, it was found necessary at one stage to use oats which had been set aside for human consumption, for animal feed because of the heavy demand for feed oats which arose. In spite of this step there was a period in which orders for feed had to be held over until the landing of the imported oats. The exceptional demand for oats during the period 1945-46 is reflected in the figures below, which represent oats sales up to 31 October, 1946. The 1944-45 sales are included for purposes of comparison (bags of 150 lb. net).

	Locally-grown.	Imported.	1945/46 Total.	1944/45 Total.
Seed	296,723	594	297,317	165,926
Breakfast food	89,187	436,457	525,644	328,792
Feed	195,566	538,577	734,143	549,804
Miscellaneous	15	—	15	15
	581,491	975,628	1,557,119	1,044,537

It will be observed that the seed sales (excluding the 594 bags of imported oats sold outside the Union) exceed the figure for the previous year by 131,391 bags, that the feed figure of 184,339 bags exceeds that for 1944-45, and that the figure representing human consumption is 196,852 bags higher than the corresponding figure for 1944-45.

In so far as the distribution of barley and oats is concerned, the 1945-46 season was the most difficult one since the imposition of control over these cereals at the end of 1942. The distribution was rendered most difficult because of the following factors. The Orange Free State experienced a total crop failure as a result of drought conditions; the purchases in that province decreased from 277,000 bags in 1944-45 to 2,600 bags in 1945-46. In the Cape Province the crop was concentrated in the south-western districts. Furthermore, the rains at the beginning of the 1945-46 season were late in coming and when the drought was broken, all the grain-growing areas received rain at the same time, with the result that an immediate demand arose for seed in all these parts. Added to this, there was the unprecedented increase in the demand for seed and feeds—*representing in all an increase of about* 337,000 *bags of barley and oats*. Owing to the danger of exotic plant diseases, imported cereals could not be released for seed purposes.

It is evident therefore that, as a result of the abovementioned factors, a far greater demand had to be satisfied than the normal, and within about a quarter of the period. To make matters worse, there was a serious shortage of trucks. The rationing system, naturally, also contributed towards the delay, although the Wheat Industry Control Board did its level best to expedite deliveries. A certain measure of delay is, of course, unavoidable under a system of rationing which is based on sworn statements, but under the prevailing circumstances of general shortage, it was, unfortunately, imperative to introduce such a system. This system presented the only method by which an equitable and rational distribution could be effected.

For the coming season (1946-47) the Board will have at its disposal full particulars obtained from the sworn statements, and these particulars will make a simpler system possible—in so far as supplies permit.

Rye.

The price paid to producers for rye by the Wheat Industry Control Board during the season 1945-46 was 25s. per bag of 200 lb. The price was 1s. 6d. per bag higher than that for 1944-45 since it was felt that rye may be used while the wheat shortage persists in the form of rye bread for supplementing the country's bread supplies. It naturally stands to reason, as was indicated in the previous report, that this consideration will no longer hold when the wheat supplies are again freely available, and that the price of rye will then have to be fixed in accordance with its feed value.

The wholesale prices for rye flour and rye meal were 48s. 3d. and 42s. per 200 lb., respectively, and the minimum and maximum prices of rye bread were 7½d. and 8¾d. respectively, i.e. ½d. per loaf higher than in 1944-45. These prices were applicable up to and including 30 April, 1946. In view of the shortage of wheat, the Government had decided to import 287,000 bags of rye, of which 228,000 bags had already been received on 31 October, 1946. At the beginning of the season the Board's selling price for rye for all

purposes amounted to 27s. 9d. per bag, i.e. 2s. 9d. per bag higher than the purchasing price. Of this amount of 2s. 9d. the sum of 9d. was intended to cover the Board's and the agent's commission (3d. and 6d. per bag, respectively) and 2s. for building up a rye-reserve fund. Since, however, the price of imported rye was much higher than that of locally-grown rye, and it was decided not to subsidize the price of rye bread, it was necessary to increase the selling prices of rye as well as the prices of rye flour, rye meal and rye bread as from 1 May, 1946. The Board's selling price of imported as well as of locally-grown rye was increased to 58s. 2d. per bag as from that date—the weighted average of the price for the locally-grown crop as well as for the imported quantity. The selling prices of rye flour and rye meal were increased accordingly to 96s. 5d. and 81s. 2d. per 200 lb., respectively (wholesale). The minimum and maximum selling prices of first-grade rye bread were increased to 11½d. and 12¾d. per 2 lb.-loaf, respectively. Since the increased flour and meal prices were to represent a gain to millers on supplies of locally-grown rye which they had on hand as at 30 April (as they had bought these supplies at the lower price), it was necessary to collect the differences from millers by way of an equalization levy of 30s. 5d. per bag on rye, 48s. 2d. per bag on rye flour and 39s. 2d. per bag on rye meal which they had on hand at midnight 30 April, 1946.

Up to and including 31 October, 1946, the Wheat Industry Control Board had purchased the following quantities of locally-grown rye (bags of 200 lb. net):—

South-western Cape Province	69,553
Remainder of Cape Province	1,887
Orange Free State	702
Transvaal	981
	73,123

Rye was sold as follows:— (in bags).

Milling purposes	148,445
Seed	29,996
Feed	1,679
Miscellaneous	600
	180,720

Of these quantities, 75,447 bags consisted of locally-grown and 105,273 bags, of imported rye.

The economy measures imposed on wheat and wheaten products with a view to tiding the country over the difficult period, were also partially applied to rye and rye products. As from April 1946 rye products could, for example, no longer be used for confectionery and the economy measures imposed on wheaten bread were applied to rye bread as well.

In so far as rye and oats are concerned, the prospects for 1946-47 show a considerable improvement as compared with those of the past year, but in the case of barley they are far from bright. As in the past the prices of barley, oats and rye for the following season, were announced in advance. In the case of rye the producers' price will be increased from 25s. to 27s. per bag. The prices of barley will then be increased as follows:—

Class A, first grade	25s. 0d. per bag of 150 lb. net.
Class B, first grade	24s. 0d. per bag of 150 lb. net.
Class C, first grade	15s. 6d. per bag of 150 lb. net.
Class D, first grade	30s. 0d. per bag of 200 lb. net.

The prices of oats will be increased to 16s. and 15s. 6d. for Class A, first grade and Class B, first grade respectively.

Meat.*

The drought conditions which obtained over extensive areas, right into January 1946, necessarily had an adverse effect on the supply of slaughter stock to the controlled areas, and during the last few months of 1945 and the first weeks of January 1946 a serious shortage of slaughter stock arose on the controlled market.

The following table reflects the slaughterings in the controlled areas (private slaughter poles excluded) during the year under review:—

Period.	Cattle.	Calves.	Sheep.	Pigs.
1945—				
September	47,129	7,052	130,803	31,303
October	44,202	8,591	193,259	36,740
November	35,206	7,472	247,490	32,638
December	25,663	6,173	160,537	32,358
1946—				
January	29,880	6,880	106,281	30,009
February	43,548	4,707	89,988	24,800
March	66,326	5,080	141,757	26,767
April	72,813	5,538	148,940	28,023
May	74,851	7,424	137,115	27,685
June	60,472	7,674	119,619	26,494
July	63,973	8,020	175,694	24,326
August	64,451	7,900	184,918	23,268

Our stock farmers have undoubtedly suffered severe losses as a result of the drought and, in addition, the shortage of cereals as a pig feed has induced a decrease in our pig population with a resultant pork shortage.

The supplies of sheep and pigs were consistently inadequate, even subsequent to March 1946, when a general improvement took place in the supply of slaughter stock to the controlled areas. The position, however, again deteriorated from the beginning of June 1946 in respect of the Witwatersrand, Pretoria, Durban and Pietermaritzburg areas, but this retrogression was only of a temporary nature and a considerable improvement set in from the second half of July 1946.

As in the previous year, considerable supplies of beef were placed in cold storage this year in all controlled areas and also at Walvis Bay during times when the supply position showed an improvement, for issue during times of scarcity.

The neighbouring territories, and especially the Bechuanaland Protectorate have, during the past season, again dispatched considerable numbers of animals to the controlled markets. During December 1945, the numbers sent from these territories also showed a considerable decrease as a result of the drought, but the season for South-West Africa set in earlier than usual, and in February 1946 large numbers of livestock were beginning to be offered for sale and since then the supply has been maintained at a high level for the remainder of the season.

* For particulars with regard to the meat scheme, see annexure report of the Director of Meat Supplies.

The following figures reflect the importation of slaughter stock from the relative territories for the past two seasons:—

	January to July 1945.		January to July 1946.	
	Cattle.	Sheep and Goats.	Cattle.	Sheep and Goats.
Bechuanaland	9,781	—	16,605	—
Swaziland	6,269	—	5,609	—
Basutoland	734	—	53	—
South West Africa	34,203	16,925	75,642	3,648

Prices.

New prices were fixed for the trade during the year under review, but producers' prices remained unchanged.

Cattle.—In so far as producers' prices are concerned, it should be noted that the seasonal price increase for cattle has been raised from 10s. to 15s. per 100 lb., with a view to rendering it more profitable for farmers to fatten their cattle and to market proportionally more cattle during times of short supplies. Consequently, prices were progressively decreased by 1s., 1s. 6d. per 100 lb. respectively, for each of the three weeks following on the week ended 14 April, 1946, and this level was maintained until 16 June, 1946. From 17 June, 1946, the seasonal increases were recommenced and after this date the basic price was increased weekly as follows:—

17 June to 25 August, 1946, 6d. per 100 lb. per week:—
26 August to 28 October, 1946, 1s. per 100 lb. per week.

Consequently the seasonal peak will be reached on 28 October, 1946, when the price per 100 lb. will be 15s. above the initial price.

The margin between the producers' prices for the various grades has not been disturbed.

Sheep, lambs, goats and calves.—The prices paid to producers during the 1945-46 season in respect of sheep, lambs, goats and calves remain unchanged for the 1946-47 season.

Pigs.—The grading of pigs has been changed and the lowest grade previously described as roughs, has been subdivided into two grades, namely Grade I, Roughs, and Grade II, Roughs, for which the prices have been fixed at 6d. and 3½d. per lb. dressed weight respectively, as compared with the single price of 5¼d. per lb. dressed weight for the previous season.

With a view to compensating producers for the increase in the price of feeds, the price of baconers has been increased as from 15 July, 1946, by 1d. per lb. dressed weight for Grade I and ½d. per lb. for Grade II. The prices of other classes of pigs have not been changed.

Dairy Products.

During the past 12 months the dairy industry experienced a difficult time and, since this industry is very sensitive to drought conditions, the drought in the spring and early summer of 1945 exercised an adverse effect on dairy production, and it was not until early in 1946 when general rains fell over large areas, that the corner was turned. It stands to reason that with practically no natural grazing available, the feed position was most critical.

Butter.

The production of creamery butter in the Union, South West Africa, Bechuanaland and Swaziland was approximately 41,000,000 lb., the lowest production level for the past 8 years. The figure was roughly 6,000,000 lb. less than that for 1944-45 and as much as about 14,000,000 lb. less than the figure for 1943-44. The decrease in supply was a heavy blow to the consumer who already had to be satisfied with a considerably decreased supply of vegetable fats.

The accumulated supplies of butter in cold storage at the beginning of the winter amounted to about 7½ million lb., which could be utilized for supplementing the inadequate production and for maintaining a reasonable distribution amongst consumers.

Cheese.

In so far as cheese is concerned, the percentage decrease was about the same as in the case of butter and the production dropped from almost 17,000,000 lb. to about 15,000,000 lb. Cheese production during the previous few years was not subject to the same fluctuations as butter, and the production ranged from 16 to 17 million lb.

The *per capita* consumption of cheese is still relatively low and the market is capable of absorbing considerably larger quantities than those which were available throughout the last few years. In view of the steadily increasing demand for fresh milk and condensing milk, larger supplies of cheese milk are being diverted for this purpose.

Condensed Milk.

The quantity of milk delivered to condensing-milk factories shows a considerable decrease as compared with deliveries during the previous year, and consequently the output of the factories was totally inadequate for meeting the requirements of the population, while at the same time, the oversea position did not allow of any large-scale exportation to the Union.

Prices.

The following tables reflect particulars of the prices which were operative in respect of the various products:—

CREAMERY BUTTER.

Period.	Grade.	Wholesale per lb.	Retail per lb.
		s. d.	s. d.
1/9/1945 to 31/10/1945	First	1 11	2 1
	Second	1 9	1 11
	Third	1 7	1 9
1/11/1945 to 31/1/1946	First	2 0	2 2
	Second	1 10	2 0
	Third	1 8	1 10
1/2/1946 to 31/8/1946	First	2 1	2 3
	Second	1 11	2 1
	Third	1 9	1 11

BUTTERFAT.

Period.	Grade.	Price per lb.	Premium per lb.
		s. d.	d.
1/9/1945 to 31/10/1945	First	1 9	7
	Second	1 7	7
	Third	1 5	7
1/11/1945 to 31/1/1946	First	1 11	4
	Second	1 9	4
	Third	1 7	4
1/2/1946 to 31/8/1946	First	2 1	4d. during June and 6d. during July and Aug.
	Second	1 11	
	Third	1 9	

CHEESE (CHEDDAR).

Period.	Grade.	Wholesale per lb.	Retail per lb.
		s. d.	s. d.
1/9/1945 to 31/10/1945	First	1 5½	1 8½
	Second	1 4½	1 7½
	Third	1 2½	1 5½
1/11/1945 to 31/1/1946	First	1 6	1 9
	Second	1 5	1 8
	Third	1 3	1 6
1/2/1946 to 31/8/1946	First	1 7	1 10
	Second	1 6	1 9
	Third	1 4	1 7

CHEESE MILK.

Period.	Per Gall.	Per lb. Butterfat.	Per Gall.	Per lb. Butterfat.
	d.	s. d.	d.	d.
1/9/1945 to 31/10/1945	9¾	2 3	2½	6¾
1/11/1945 to 31/1/1946	10¼	2 4½	2	5½
1/2/1946 to 31/5/1946	10¾	2 5¾	—	—
1/6/1946 to 30/6/1946	10¾	2 5¾	2	5½
1/7/1946 to 31/8/1946	10¾	2 5¾	2½	6¾

CONDENSING MILK.

Period.	Price per Gall.	Price per lb. Butterfat.
	d.	s. d.
1/9/1945 to 31/1/1946	13¾	3 0¾
1/2/1946 to 31/5/1946	11¾	2 8¾
1/6/1946 to 30/6/1946	13¾	3 2¼
1/7/1946 to 31/8/1946	14¼	3 3½

FARM-DAIRY BUTTER AND FARM BUTTER.

Period.	Price.
1/9/1945 to 31/8/1946	2s. 6d. per lb. maximum.

Margarine.

In last year's report it was stated that margarine would perhaps be on the market during the second half of 1946, but only if all the necessary machinery and plants were available and in production by then and adequate supplies of raw material for the manufacture of margarine were on hand.

The shipping of machinery and plants was, however, unavoidably delayed for a time because of strikes and shipping difficulties and, in addition, the shortage of oil-bearing seeds, that indispensable raw material for the production of margarine, has rendered the commencement of production impossible. At the close of the report year the position is still uncertain.

Deciduous Fruit.

Except for a small quantity to Sweden, there was no export of deciduous fruit during the 1945-46 season, and the Government was again obliged to subsidize the deciduous fruit industry to the extent of £230,000. This amount was £50,000 less than the contribution for 1944-45. As for the previous season, a Land Bank loan to an amount of £750,000 was made available to the Board to finance the scheme, which loan has been repaid in full.

With the exception of grapes, the crops were poor, pears being nearly 50 per cent. below normal.

The total prices (advance plus final payment) were approximately the same as those paid to producers during the previous season and, similarly, the sales policy also remained the same for 1945-46. From certain dates the maximum wholesale and retail selling prices of pears, plums and grapes were again fixed. The prices of peaches were not fixed for this season. Grapes were packed in half-lugs, under two grades, i.e. Choice and Standard, and plums were also packed in half-lugs in order to save packing material.

Adverse climatic conditions on the Johannesburg market for a period of five weeks detrimentally affected the marketing of grapes.

The quantities of fresh fruit disposed of by the Board on the various markets, to the Departments of Social Welfare and Defence, and to factory workers, are shown in the following schedule:—

	1943–44 (tons).	1944–45 (tons).	1945–46 (tons).
Peaches	1,325	918	784
Plums	1,951	1,250	444
Pears	2,126	4,367	1,929
Grapes	17,597	18,102	18,178
TOTAL	22,999	24,637	21,335

The direct sale of grapes by producers, with the Board's approval, was as follows:—

	1943–44 (tons).	1944–45 (tons).	1945–46 (tons).
Grapes	4,309	5,090	4,464

The quantities sold to canning factories or processed by the Board itself were as follows:—

	1943–44 (tons).	1944–45 (tons).	1945–46 (tons).
Plums	5,262	5,192	4,502
Pears	11,846	13,676	8,069
Grapes	24,934	19,039	18,991
TOTAL	42,042	37,907	31,562

The total quantities of fruit exported were as follows:—

	1943–44 (tons).	1944–45 (tons).	1945–46 (tons).
Peaches	—	—	49
Plums	—	—	164
Pears	—	—	667
Grapes	—	—	660
TOTAL			1,540

Fifty tons of grapes were exported to the United States of America and the balance to Sweden.

The total quantities handled were, therefore, as follows:—

	1943–44 (tons).	1944–45 (tons).	1945–46 (tons).
Peaches	1,325	918	833
Plums	7,213	6,442	5,110
Pears	13,972	18,043	10,665
Grapes	46,840	42,231	42,293
TOTAL	69,350	67,634	58,901

Citrus Fruit.

The 1945-46 citrus crop was estimated at 5,000,000 cases of export quality, and of this, 2,767,629 cases were exported, as compared with 981,851 cases exported during the previous season.

The 1946-47 crop is estimated at 3,278,000 cases of export quality, and of this quantity 946,837 cases of oranges, 294,165 cases of grapefruit and 8,992 cases of lemons had been exported up to the 15th August, 1946. The total quantity of citrus exported to the

United Kingdom and other countries up to the end of August 1946, was 1,370,336 cases, of which 1,285,702 cases went to the United Kingdom, 59,523 cases to Sweden, 14,609 cases to Belgium and the balance to other countries, including Mauritius.

It is estimated that by the end of the 1946-47 season a total of approximately 2,458,500 cases will have been exported.

In view of the short crop this season—which is less than 60 per cent. of the normal—the citrus industry offered to retain 25 per cent. of the exportable crop for sale in the Union in order that supplies to local markets in the Union would not be curtailed unduly. The direct loss to citrus growers as a result of retaining their fruit will be approximately £200,000.

During the 1945-46 season 6,650,000 pockets of citrus fruit were sold in the Union by exporters. It is estimated that a total of 6,000,000 pockets of citrus will be disposed of in the Union during the 1946-47 season. Of this, the following quantities had been marketed, through the Citrus Board, up to the 15th August, 1946:—

	First Grade. (export quality).	Second Grade.	Total.
Oranges (pockets)...............	884,508	744,615	1,629,123
Grapefruit (pockets)............	179,738	305,723	485,461
Lemons (pockets)...............	58,851	58,063	116,914
TOTAL (pockets)......	1,123,097	1,108,401	2,231,498

In addition, it is estimated that a further 500,000 pockets were disposed of direct by growers who do not fall under the Board's control and by "controlled" growers with the permission of the Board.

Maximum producers' prices for fruit sold in the Union during the "in-season" period commencing 13 April, 1946, were fixed as follows:—

	First Grade (export quality).	Second Grade.	Total.
	s. d.	s. d.	s. d.
First Grade—			
Extra Large..........................	3 9	3 6	—
Large....................................	3 6	3 0	3 3
Medium..................................	3 3	2 9	2 9
Second Grade—			
Extra Large..........................	3 0	3 0	—
Large....................................	2 6	2 6	2 9
Medium..................................	2 3	2 3	2 3
Small.....................................	1 9	1 9	1 9
Third Grade..............................	2 0	2 0	2 0

In respect of oranges exported to the United Kingdom, the following prices are being paid this season, according to the weight and condition of the fruit, irrespective of size:—

Weight of Case.	Condition.						
	1	2	3	4	5	6	7
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
50–61 lb............	20 9	20 0	19 3	16 6	10 3	5 0	9
61–65 lb............	21 6	20 9	20 0	17 3	10 9	5 3	1 0
65–69 lb............	22 6	21 9	20 9	18 0	11 3	5 6	1 0
69–75 lb............	24 6	23 9	22 9	19 6	12 3	6 3	1 3

NOTE.—1st Condition means not less than 98 per cent. sound fruit.
4th Condition means not less than 75 per cent. sound fruit.
7th Condition means not less than 10 per cent. sound fruit.

On the basis of these prices, and after deduction of all costs incurred from orchard to market, the growers should receive approximately 2s. per pocket net at the tree for export quality oranges sold in the Union, and 4s. per pocket net at the tree for export quality oranges exported.

It will thus be seen that under conditions of short supply citrus growers have subsidized the Union consumers to some considerable extent, particularly when the following comparative prices of oranges in other countries are taken into consideration.

In the Union ... ... 1½d. per lb. (approximately).
In the United Kingdom ... ... 7½d. per lb. (approximately).
In the United States of America 5d. per lb. (approximately).
In Australia ... ... 8d. per lb. (approximately).

From the point of view of the producer, the industry wholeheartedly supports the policy of the Citrus Board to maintain reasonable supplies on the local markets at reasonable prices to consumers.

The prices being paid by the British Ministry of Food for grapefruit and for lemons are also on a sliding scale similar to that for oranges, as set out in the schedule, and vary in the case of grapefruit from 23s. to 16s. 3½d. for first condition fruit according to weight of case down to 1s. 8d. per case for seventh condition fruit, and in the case of lemons from 17s. 3d. to 12s. 9d. per case for first condition fruit according to weight down to 3d. per case for seventh condition fruit.

The greatly reduced 1946-47 citrus crop is the result of drought conditions during the past eighteen months. Extremely dry conditions still prevailed up to the end of August 1946 in the south-eastern parts of the Union, and though the 1947-48 citrus crop is expected to be substantially better than that produced during the present season, it will still be short of normal.

Fortunately the droughty conditions did not assume such proportions as seriously to impair the general condition of the trees, which in most of the important growing areas is still good. Many orchards throughout the country are, however, now beginning to show the symptoms of a lack of nitrogen due to the continued shortage of nitrogenous fertilizers.

During the war years most citrus nurseries greatly curtailed their production of young trees, but are now again producing trees on a fair scale. For the next year or two most of the young citrus trees put out by nurseries will be required by growers to replace old, unprofitable trees or orchards. On many citrus properties replacement

programmes were cut down or suspended during the war years and a good deal has to be done in making up the leeway in this respect.

The incidence of Black Spot disease on citrus fruit in areas previously free of this malady is the cause of much concern. Investigations are proceeding with the object of finding a means to eradicate or control this disease.

The Citrus Board is still operating under and by virtue of powers vested in it by War Measure No. 9 of 1946, but the revision of the South African Citrus Scheme of 1939 under the amended Marketing Act, is now under consideration.

Dried Fruits.

For the 1946 season the production is about 15,500 tons, as against 17,400 tons in 1945. The sultana production was again considerably lower, viz. 2,004 tons, as against 3,400 tons in 1945 and the apricot yield was only about 150 tons as against 680 tons in 1945. The total production of tree fruits was about 3,400 tons as against 4,435 tons in 1945, and in comparison with 1944, the production of dried tree fruit amounts to almost 1,800 tons less this year. This large decrease is mainly due to the heavier demand for fresh fruit for canning and to the apricot crop failure.

As a result of the decrease in production and the expected lifting of the export regulations, packers have tried to take in as much fruit as possible. Consequently 1,000 tons of raisins only could be exported this year. Peaches were in short supply and the same applies to apricots. Packers hope to be in a position to import about 900 tons of prunes.

As in 1945, pools were again instituted in respect of raisins, sultanas, currants and apricots (fresh and dried) and agents of the Dried Fruit Board took in all these dried fruits on behalf of the Board. Exports showed no losses, except in the case of raisins, and producers' prices are therefore generally somewhat higher than those of 1945, which represented a record year. No pool shortages are expected this year.

Since 1944 prices have been fixed for all kinds of dried fruit with the exception of specially dried vine fruits, and the present policy is to continue with these measures. The Board expects to take over full control once more and to stabilize the control by means of regulations under the Marketing Act, instead of by way of War Measures, as has hitherto been the case.

The grading regulations were also reviewed during the year and a new set of regulations was published. Various other changes are desirable, however, and the matter is receiving the attention of interested parties. The aim is to endeavour, by manipulating prices for the various grades, to encourage producers to produce a better article.

The advance prices for dried vine fruits for the past two years were as follows:—

	5 ◇ d. per lb.	4 ◇ d. per lb.	3 ◇ d. per lb.	2 ◇ d. per lb.	1 ◇ d. per lb.	Below Grade. d. per lb.
1945—						
Raisins.........	—	$4\frac{3}{4}$	$3\frac{7}{8}$	$2\frac{3}{4}$	$\frac{1}{2}$	—
O.R. Sultanas...	$4\frac{1}{4}$	4	3	$2\frac{1}{2}$	$\frac{7}{8}$	—
W.P. Sultanas...	—	4	3	$2\frac{1}{2}$	$\frac{7}{8}$	—
Currants........	7	6	5	—	—	—
1946—						
Raisins (A).....	—	$5\frac{3}{4}$	$3\frac{7}{8}$	$2\frac{3}{4}$	$\frac{1}{2}$	—
Raisins (B).....	—	$4\frac{3}{4}$	$3\frac{3}{4}$	$2\frac{5}{8}$	$\frac{1}{2}$	$\frac{1}{4}$
Sultanas (A)....	$4\frac{1}{4}$	4	$3\frac{1}{2}$	$2\frac{3}{4}$	$\frac{7}{8}$	—
Sultanas (B)....	—	$3\frac{3}{4}$	$3\frac{1}{4}$	$2\frac{3}{4}$	$\frac{7}{8}$	—
Currants........	$6\frac{3}{4}$	$5\frac{3}{4}$	$4\frac{3}{4}$	—	—	—

Eggs.

The production of eggs during the past year was higher than in the previous year, while the demand for eggs decreased considerably as a result of the smaller purchases for the army and for ships and the austerity measures imposed on the baking industry.

Due to circumstances relating to the price of poultry feed, it was found necessary to increase prices as early as in September 1945, whereas during the previous year prices were not changed until November; on 28 September, 1945, the following prices were fixed:—

	Wholesale. (per dozen).	Retail. (per dozen).
	s. d.	s. d.
Grade I—		
Extra large	1 11	2 2
Large	1 9	2 0
Medium	1 7	1 10
Small	1 5	1 8
Grade II—		
Large	1 7	1 10
Medium	1 5	1 8
Small	1 3	1 6
Grade III—		
Miscellaneous	1 4	1 4

On 30 November 1945, all the prices, with the exception of those of third-grade eggs, were increased by 3d. per dozen, on 14 December by 3d., on 11 January 1946, by 3d., on 1 February by 4d. and again on 1 and 29 March, so that the wholesale prices exceeded those prevailing on 29 September 1945, by 1s. 11d. per dozen and the retail prices exceeded the then prevailing prices by 2s. per dozen.

This price-fixation was revoked on 12 July 1946, but was again instituted on 19 July and also adjusted on 9 August, so that the prices were 1d. per dozen lower than the prices which became operative on 28 September 1945.

Ever since 1942 a purchasing scheme is instituted annually in order to effect regular distribution and stabilize prices; the schedule below furnishes particulars of the supplies which were held in cold storage each month during the past 3 years.

	Boxes of 30 Dozen Each.		
	1943.	1944.	1945.
September	54,727	32,048	47,989
October	99,744	42,091	79,293
November	125,340	62,200	86,304
December	133,197	67,998	90,620
	1944.	1945.	1946.
January	134,777	69,735	83,662
February	131,785	66,661	73,799
March	119,207	55,685	60,989
April	100,202	36,473	44,916
May	74,172	12,128	26,509
June	44,522	1,415	10,325
July	28,839	Nil	Nil
August	14,078	Nil	Nil

Prior to 12 April 1946, maximum prices for eggs were fixed for controlled areas only, but since this date a maximum price was fixed for the sale of eggs throughout the Union (except in the controlled areas) viz. 3s. 8d. per dozen.

The following maximum wholesale and retail prices were fixed in respect of cold-storage eggs as from 22 February, 1946.

	Wholesale.	Retail.
	s. d.	s. d.
Grade I—		
Extra Large	2 5	2 8
Large	2 3	2 6
Medium	2 1	2 4
Small	1 11	2 2
Grade II—		
Large	2 1	2 4
Medium	1 11	2 2
Small	1 9	2 0
Grade III—		
Miscellaneous	1 9	1 10

These prices are 1d. per dozen higher throughout than those fixed on 2 February, 1945.

Groundnuts.

It is common knowledge that a world shortage of oil-bearing seeds exists and is likely to continue for another few years. This shortage has naturally given rise to a very difficult position in the Union. The scarcity of vegetable fats for domestic use and for the manufacture of soap and the inadequate supplies of protein-rich foodstuffs for our stock have created a serious problem.

Since groundnuts are rich in oil, large quantities of fats and oil-cakes are prepared from them and, consequently, the Department has again, as in 1944 and previous years, found it necessary to encourage our farmers to increase their production of this crop.

A groundnut loan scheme was announced at the end of 1945 and credit facilities created thereunder for farmers for the purchase of a maximum quantity of 8 bags of groundnut seed, the cost of which is repayable within 12 months from the date of the loan, with interest at 4 per cent. per annum. The scheme was made operative in the following areas:—

Transvaal.—Waterberg, Potgietersrust, Pietersburg, Soutpansberg, Letaba, Groblersdal, Middelburg, Lydenburg, Pelgrimsrust, Barberton, Nelspruit, Bronkhorstspruit and Pretoria.

Natal.—Dundee, Helpmekaar, Newcastle, Utrecht, Vryheid, Paulpietersburg, Estcourt and Weenen.

Other areas.—The Vaalhartz irrigation area.

Apart from the loan scheme, groundnuts were produced even in the northern Orange Free State, in the neighbourhood of Parys and Vredefort where this crop had not been grown in the past.

The groundnut crop of 1946 which will reach trade channels, is estimated at 250,000 bags of 100 lb. (shelled) as compared with 120,000 bags for 1945. Hence, the crop has been almost doubled.

In view of the short supplies, the Director of Food Supplies and Distribution has frozen the supplies for utilization for special purposes. The price of groundnuts is at best, the maximum price as

fixed by the Price Controller, viz. 35s. 9d. per 100 lb. unshelled, and 55s. per 100 lb. shelled, while the price for under-grade groundnuts is fixed in accordance with the agreement between purchaser and seller.

Potatoes.

Already for a number of years maximum prices for potatoes have been fixed regularly, but compulsory grading has only been applied on the nine large markets, since July 1945, when three grades were introduced, viz. first, second and third grades. Since then, however, the grading regulations were revised to provide for under-grade as well.

Government graders hold regular inspections at all the large municipal markets, and also at the shops or places where potatoes are stored or sold, to ascertain whether the regulations are carried out.

The maximum prices fixed on 23 July 1945, according to grades and classes, make provision for a producers' price of 30s. per bag for Grade I, 26s. 6d. per bag for Grade II, and 22s. per bag for Grade III, while the prices to markets and agents were fixed at between 2s. 3d. and 2s. 6d. higher and to consumers at 9d., 8d. and 7d. per 3 lb. of the respective grades. These prices were increased on 17 August and 21 September 1945, but were slightly reduced on 15 March 1946, until the following prices were fixed on 16 August 1946. In direct sales between producer and dealer the maximum prices are 34s. 6d., 33s. 6d., 27s. 6d., 22s. and 15s. per bag of 150 lb. f.o.r. first grade classified, first grade unclassified, second grade, third grade and below grade, respectively, while the prices of 35s. 3d., 34s. 3d., 28s. 3d., 22s. 9d. and 15s. per bag are applicable to the respective grades when the producer sells by auction or otherwise, through an auctioneer, market agent, broker or other agent and 37s. 9d., 36s. 9d., 30s., 24s. 3d. and 15s. per bag for the respective grades when the producer sells through a market master.

Consumers' prices were fixed at 10d. per 3 lb., 10d. per 3 lb., 11d. per 3 lb. and 7d. per 3lb., with the exception of under-grade potatoes, for quantities of less than 150 lb. Outside the controlled areas the maximum consumer's price was fixed at 11d. per 4 lb.

Generally speaking, the price level was the same as for the previous year.

The potato crop for the 1945/46 season is estimated at 2,885,000 bags as compared with 2,500,000 bags for the 1944/45 season, and the position shows a considerable improvement. It was not found necessary to exercise control, as during the previous two seasons. The quantity of first-grade potatoes in relation to the other grades was, however, not quite adequate.

In the course of the season the producers carried out the grading requirements satisfactorily and the difficulties gradually disappeared. In addition, the adaptation of the grades has also been facilitated.

As stated above, the yields of the various potato areas were very satisfactory, except that the lowveld crop unfortunately suffered a set-back as a result of frost and was not marketed until late.

A quantity of potatoes of inferior quality for which there was no demand in the Union, but which, nevertheless, was suitable for planting, was allowed for export to Portuguese East Africa, on the understanding that an equal quantity of table potatoes would be supplied to the Union later.

The quantities of potatoes disposed of during the previous three calendar years on the eight big markets of the Union are: 1934: 336,274,900 lb.; 1944: 175,263,400 lb.; and 1945: 220,699,200 lb.;

During the past year the Department again, as in previous years, imported seed potatoes on behalf of the State in order to maintain potato production. The quantity imported over the period of twelve months totalled 25,000 boxes. This step was taken simply because, under the prevailing circumstances the Department was in a better position than private enterprise to obtain supplies and shipping space.

Since local conditions are so favourable for virus infestation with its resultant degeneration of seed potatoes, the Union has up to the present been compelled to import seed potatoes for the maintenance of potato production, but very valuable selection experiments are at present being undertaken on the Riet River Settlement on potatoes with a view to breeding seed potatoes suitable for distribution amongst farmers for production purposes.

Vegetables.

The supply position in respect of vegetables was satisfactory, and in any case, better than during the previous year. The lowveld crop had been most promising before it was damaged by frost. The winter supplies were larger than during the previous year, but of a somewhat poorer quality. Tomatoes and cabbages were freely obtainable throughout the winter months.

As a result of favourable climatic conditions during autumn in respect of both vlei and ridge soils and also because of larger plantings, the Cape Town market was for a time glutted with a few kinds of vegetables. In a special endeavour to ease the position in Cape Town, the Food Control Organization tried to facilitate distribution by opening a central dépôt and bringing more mobile markets into operation. The chief aim was to utilize the low price level prevailing in favour of the consumer and so increase consumption, for the benefit of the consumer as well as the producer who had the surplus on hand.

The following table shows the sale of 7 of the most important vegetables on the 8 large markets for the calendar years 1943-1945 :—

	1943. (in 100 lb. quantities).	1944. (in 100 lb. quantities).	1945. (in 100 lb. quantities).
Onions	464,917	509,553	546,953
Sweet Potatoes	238,431	301,688	333,524
Tomatoes	495,621	761,969	856,189
Green beans	179,313	195,523	187,397
Green peas	183,881	187,451	174,996
Cabbage	470,015	494,995	494,653
Cauliflower	90,776	90,493	76,241
TOTAL	2,122,954	2,541,672	2,669,953

The glut which for a time obtained on the Cape Town market in respect of a few kinds of vegetables, mainly carrots, is due to the fact that farmers relied on the canning and dehydration factories for orders which would absorb their produce, whereas the factories, owing to a shortage of tin sheets and the absence of a market for their products, were not in a position to process vegetables and so alleviate the position. With the cessation of hostilities the Admirality did not enter into any further contracts for dehydrated vegetables and since the British Ministry of Food did not show any interest

worth mentioning in the product and no alternative export market was available, the dehydration factories practically had to stop production. Actually they have considerable supplies on hand.

Viticultural Products.

The production of spirits fluctuated considerably during the past three years, while that of brandy remained about the same and the available supply of wines did not increase to any marked extent. The consumption of spirits and brandy, for purposes other than fortification, however, showed a considerable increase in 1945, as compared with the previous year.

The following table gives comparative figures:—

Year.	Production of spirits including Classes B and C in Proof Gallons.	Production of Brandy in Proof Gallons.	Available good and quantity wines for local consumption in Leaguers.
1943	4,974,819	1,294,269	93,728
1944	5,879,217	1,271,239	97,537
1945	5,055,619	1,300,308	101,872

Year.	Total Local Consumption of Spirits and Brandy in the form of Brandy, Gin and Liqueurs in Proof Gallons.	Consumption of Mixed Brandy in Proof Gallons.	Consumption of Spirits for Fortification including Class B in Proof Gallons.
1943	2,646,779	2,153,755	2,038,323
1944	2,588,707	2,098,287	2,121,321
1945	3,300,298	2,643,977	2,076,313

Except in the case of gin, liqueurs and Vermouth, the liquors exported during the year under review, show a considerable increase as reflected in the following table:—

	1944/45.		1945/46.	
	Gallons. in Barrels.	Gallons. in Bottles.	Gallons. in Barrels.	Gallons. in Bottles.
Samples investigated	1,917	4,982	1,938	4,947
Dry White Wines	73,236	74,407	114,558	121,967
Dry Wines	709,688	65,188	891,966	100,073
Sherry	338,586	138,815	561,808	66,977
Sweet Wine	692,000	62,272	1,127,420	59,166
Brandies	—	420,217	—	468,574
Gin	—	164,922	—	60,014
Liqueurs	—	34,040	—	29,366
Vermouth	132,666	42,515	110,536	45,452

The minimum price of good wine for the 1946 season was fixed at £8 per leaguer f.o.r., wine farmer's station, and the price of quality wine at £12 per leaguer. The corresponding prices for the 1945 season were £7. 10s. and £11. 10s. per leaguer, respectively.

Chicory.

During the 1945/46 crop year the following quantities of chicory were received and distributed by the Chicory Control Board:—

Grade 1	4,744,078 lb.
Grade 2	408,188 lb.
Grade 3	80,372 lb.
TOTAL: Grade Chicory	5,232,638 lb.
Under-grade	34,540 lb.
GRAND TOTAL	5,267,178 lb.

The crop was somewhat smaller than that of the previous year—a fact which is ascribable to inferior seed, severe droughts and strong winds, which caused extensive damage. The seed produced by the Department yielded excellent results, but the imported seed was disappointing.

During the year the Board disposed of 12,000 lb. of seed and consequently a larger crop is expected next year. The demand for chicory has increased considerably as a result of the decrease in tea supplies and the shortage is being supplemented by imports. The aim is to grow adequate supplies locally and the next crop will already be appreciably larger. Arrangements have been made for the importation of a further 19,000 lb. of seed from overseas for the following plantings.

The prices fixed for 1945, viz., 35s., 30s. and 25s. for the three grades remained unchanged and were maintained during 1946.

B.—Other Agricultural Products.

In addition to the food products discussed in the previous chapter, this country also produces a large diversity of other agricultural products of great economic value.

Wool.

If regard is had to the fact that there are some 40,000 European wool-growers in this country, who together own about 26½ million wooled sheep, and that wool constitutes our most important agricultural export product, the necessity for stabilizing the wool industry and the income of such a large percentage of our population will be readily appreciated.

The Wool Disposal Agreement entered into during the past year and confirmed by the Wool Act of 1946 (Act No. 19 of 1946) is the means by which the marketing of wool has been placed on a firm and longterm basis and stability ensured. This Act gives statutory approval to the agreement between the Governments of the United Kingdom, the Commonwealth of Australia, the Dominion of New Zealand and the Union of South Africa as regards the disposal of supplies of wool which have accumulated during the years of war, together with future wool clips, and provides for the institution of a South African Wool Disposal Organization as well as for the imposition of a levy on wool for defraying the costs of the scheme. The Act also institutes a statutory Wool Board, to take the place of the earlier Advisory Wool Council.

Under the Wool Disposal Agreement the 1945/46 clip was still purchased at fixed prices. Until such time as the South African Organization could be founded, the British Wool Commission continued to effect purchases. The quantity of wool bought by the British Wool Commission during the 1945/46 wool year shows a

decrease of about 26,000 bales on the quantity for 1944/45 which is probably also due to the severe drought which prevailed in large areas of the Cape Province and had an adverse effect on the clip. The wool was also of a poorer quality. The average price for the clip remained the same as during the previous season as did also the selling prices. The demand for wool at the fixed selling prices was exceptionally keen during the season. The major portion of the Union's accumulated supplies have been disposed of and at the opening of the season only about a quarter of the quantity available at the beginning of last season will be on hand.

In pursuance of the recommendation of the London Wool Conference, wool auctions will again be reviewed during the next wool season, with the backing of a reserve price which is a feature of the Wool Disposal Agreement. Wool-growers the world over, and especially in the Dominions, are anxiously awaiting the first auctions to see how world buyers will judge the price level of wool fibre.

Mohair.

The supplies of mohair disposed of at Union ports amounted to 5,479 bales on 30 June 1946, whereas the unsold supplies on the same date amounted to 2,983 bales.

Reliable figures on the export of mohair are available only in respect of the 8 months ending 28 February, 1946, when the figure amounted to 24,804 bales.

The price of mohair shows an improvement of 2d. to 7d. per lb. on that of the previous season whereas kid's mohair fetched the unprecedented price of 64d. per lb.

Hides and Skins.

In a leather-starved world it is natural that the market for hides and skins should have remained very firm while all export prices were subject to international control.

Prices to Union tanners for wetsalted, drysalted and sundried hides fixed by local control, were fully maintained until the end of June 1946, when the prices were increased by $\frac{3}{4}$d., $1\frac{1}{8}$d., $1\frac{1}{2}$d., per lb. respectively, the increase to the producer for green hides from animals slaughtered at an abattoir being $\frac{7}{8}$d. per lb.

At the same time the prices to local tanners for goat skins were increased by twenty five per cent. and for coarse and coloured sheepskins (excluding Crossbreds) by approximately 40 per cent.

The following are the maximum prices fixed:—

I. *Maximum prices of hides per lb.*

Description of Hides.	Firsts.	Seconds.	Thirds.	Fourths.
	d.	d.	d.	d.
(*a*) Drysalted—				
(1) Under 6 lb.	$14\frac{5}{8}$	$13\frac{5}{8}$	$9\frac{5}{8}$	$7\frac{5}{8}$
(2) 6 to 9 lb.	13	12	8	7
(3) 10 to 19 lb.	$10\frac{5}{8}$	$9\frac{5}{8}$	$8\frac{5}{8}$	$7\frac{1}{8}$
(4) 20 to 29 lb.	$9\frac{5}{8}$	$8\frac{5}{8}$	$7\frac{5}{8}$	$6\frac{1}{8}$
(5) 30 lb. or over	$8\frac{5}{8}$	$7\frac{5}{8}$	$6\frac{5}{8}$	$5\frac{1}{8}$
(*b*) Sundried—				
(1) Under 15 lb.	12	11	$9\frac{1}{2}$	$6\frac{1}{2}$
(2) 15 to 24 lb.	11	10	$8\frac{1}{4}$	6
(3) 25 lb. or over	10	9	$7\frac{1}{4}$	5
(*c*) Green abattoir hides	$4\frac{1}{2}$	—	—	—
Wetsalted abattoir hides	6	—	—	—

II. *Coarse and coloured skins:* Prime ... ... 12d. per lb.
Seconds ... ... 9d. per lb.
First rejects ... 6d. per lb.
Second rejects .. 3d. per lb.

On the 27th June 1946, the International Hide, Skin and Leather Committee was abolished with the result that there was an immediate increase in all prices. Individual countries, however, in an effort to prevent inflation as far as possible, applied local control and fixed prices at which local hides and skins may be sold or bought, which has had the effect of keeping import prices to these countries within reasonable bounds.

As the total production of the types of hides and skins used in local tanneries cannot be absorbed by these tanneries, the exportable surplus is sold at enhanced prices.

Merino sheepskin prices fluctuated somewhat during the period under review. At the end of August 1945, the prices for Combings, Longs, Mediums and Shorts were respectively 11½d., 9¼d., 8¼d., 7½d. per lb. as compared with 13½d., 12d., 10⅝d., 9¾d. per lb. at the end of August 1946.

Sound Angora skin prices were 10d. and 14d. per lb. respectively for the same periods.

Gloving skin prices at the end of August 1945, for sound Large, Medium and Light were 5s. 6d., 4s. 6d., 3s. 9d., each as against 12s. 3d., 11s. 3d., 9s. at the end of August 1946.

The total weight of hides and skins exported during the year under review was approximately 43,000,000 as against 34,000,000 during the calendar year 1945. The increase is primarily due to the export of Merino skins to continental countries (chiefly France and Belgium) owing to the cessation of hostilities.

A measure of improvement in the curing of hides and skins produced in abattoirs is evident, primarily due to the inspections carried out on behalf of the Controller of Leather. Farmers in general, however, still do not appreciate the need for the better flaying and curing of their hides and skins.

Hides and Skins—Exports 1945-46.

	1/9/45–31/8/46 lb.	1/1/45–31/12/46 lb.
Merinos	11,849,143	6,089,231
Shearlings	13,731,121	10,739,074
Coarse and Coloured	536,012	854,870
X Bred	657,268	615,299
Glovers	7,739,757	6,526,664
Goat skins	2,655,164	3,265,912
Angora skins	297,529	351,398
Drysalted Hides	1,380,197	1,455,633
Drysalted Kips	252,215	168,670
Drysalted Calf	337,237	263,953
Sundried Hides	2,856,559	3,153,217
Sundried Kips	281,273	305,430
Sundried Calf	70,985	155,243
Karakul skins	125,874	227,003
Ostrich	38,165	22,103
	42,808,499	34,193,700

Tobacco.

The tobacco crop for the past year amounted to 32,594,000 lb. Of these 18,034,000 lb. were air-cured, 13,774,000 flue-cured and 786,000 lb. Turkish tobacco.

Although the yield was considerably higher than the crop of 24,398,000 lb. of the previous year, the receipts in relation to the plantings were somewhat disappointing as a result of droughts and untimely rains in some areas.

The quantity of leaf tobacco processed during 1945 for disposal shows an unexpectedly large increase, viz. 33,061,000 lb. as against 30,086,000 lb. in 1944. This expansion of the market led to a sharp decline in the tobacco supplies of the country, in consequence of which the Tobacco Control Board once again introduced a duty-free import quota of 1½ million lb. and 400,000 lb. from Southern Rhodesia. Then too, there is the 400,000 lb. duty-free importation from Northern Rhodesia.

Owing to the ever-increasing costs of production, a further increase of 10 per cent. in producers' prices was allowed. The price of Virginia tobacco is at present the basic price plus 55 per cent. For Turkish tobacco, on the other hand, no price has been fixed and it rests with the co-operative society concerned to arrange prices with the manufacturers.

The average selling price of agents of the Board has increased since 1939/40 as follows:—

	1939/40. (Pennies per lb. leaf tobacco).	1945/46. (Pennies per lb. leaf tobacco).
Flue-cured	17·68	27·90
Light air-cured	11·64	23·67
Dark air-cured	7·27	13·17

Due to the poorer quality which reduced the percentage of higher grades, the average price of flue-cured tobacco shows a decrease of 0·63d. per lb. in comparison with that of 1944/45, in spite of an increase in price.

Cotton.

Due to the low prices which obtained for cotton since 1931, the production decreased tremendously and the following figures reflect this retrogression in the cotton industry from 1925/26 when the yield reached the record peak of 16,305 bales:—

Production.	*Bales of Fibre of 500 lb. Each.*
1922–23	5,218
1925–26	16,305
1929–30	12,970
1931–32	2,240
1938–39	598

With a view to the scarcity of cotton and the prospects for better prices as a result of the war, the Department in 1939 again encouraged the cultivation of cotton and the yields immediately increased to 1,649 bales in 1939/40. The expectation of higher prices did not materialize, however, and, in 1942/43, the yield decreased to 467 bales of fibre cotton and in 1944/45 to the low level of 270 bales only.

For the year 1945/46 the crop is no better but the price has suddenly revived and risen to 14d. per lb. fibre, whereas two years ago it was 8d. and after the depression of 1930 even as low as 4½d. per lb.

The erection of a cotton weaving mill, which is under way has increased the demand for cotton and there is a possibility that, if weather conditions are favourable and good rains fall before the middle of April, a fairly large area will be planted, especially in the Barberton and other lowveld areas.

III. Administrative Activities.

During the past year two important changes in the internal structure of the Department were effected.

The first of these was the regrouping of the functions of two of the divisions which maintain a very close contact with the farming community, viz. the old Division of Animal and Crop Production and the old Division of Soil and Veld Conservation now known as the Division of Agricultural Education and Research and the Division of Soil Conservation and Extension, both under the administration of a Director. This change took effect from 1 September, 1945, and agricultural education at the Colleges of Agriculture and all research work at research stations now fall under the former Division, while the latter is entrusted with the task of soil conservation and extension.

The second development was the formation, with effect as from 1 October, 1945 of the former Division of Forestry into an independent Department under the Minister of Agriculture and Forestry, with a Director as its chief.

Funds.

The expenditure of the Department for the financial year 1945/46 amounted to approximately £8,625,758 under the various votes, whereas the revenue amounted to £601,780 as compared with £6,990,356 and £370,497 respectively, for the year 1944/45.

The increase is reflected in all the votes of the Department, but the extension of the activities in respect of soil and veld conservation which accounted for an increase in expenditure of from £163,300 to £251,970 and the increase in expenditure of the Division of Veterinary Services from £542,511 to £648,124 for the respective financial years, merits special mention. The expenditure of £8,625,758 includes £6,209,424 for various subsidies, mainly consumers' subsidies amongst which may be mentioned the subsidies in connection with the importation of maize and the stabilization of its price and also the importation of wheat and the stabilization of the price of bread. A special subsidy of £200,000 was paid to citrus farmers during the year 1945/46 by way of compensation for the pool losses sustained by them in respect of the 1944 crop owing to the fact that no export market existed.

The increased revenue figure for 1945/46, as compared with that of 1944/45, is mainly due to the amount of £147,657, repaid by the Land and the Agricultural Bank of South Africa in respect of a loan granted to the Deciduous Fruit Control Board for the precessing of fruit—a loan originally granted by the Department but subsequently paid out by the Bank mentioned.

Staff.

The Departmental organization, the machinery designed for maintaining and continuing the activities of the Department, necessarily underwent considerable changes as a result of resignations, transfers, promotions, superannuations and the return of officers from military service. The most important changes include, inter alia: The promotion of Dr. M. M. S. du Toit, Director of the Western Province Fruit Research Station, Stellenbosch, to the post of under-Secretary in succession to Colonel C. J. van Heerden who is now a Public Service Commissioner; the resumption of service of Mr. N. J. Eddy as Principal Accountant, after serving in the Department of Defence; the promotion to the post of Chief Clerk, Grade 1, of Mr. H. J. Neethling; the promotion to the post of Director of the Division of Agricultural Education and Research of Dr. H. W. Turpin and the promotion to the post of Assistant Director of Dr. A. R. Saunders; the promotion of Messrs S. J. de Swardt and C. H. Spamer to the posts of Chief and Assistant Chief of the Division of Economics and Markets, respectively; the promotions of Dr. J. C. Fick and Mr. T. F. Cronje to the posts of Assistant Directors of the Division of Soil Conservation and Extension.

The following senior officers of the Department passed away during the year: Mr. M. M. Neser, Senior Veterinary Officer, and Mr. A. S. Rayner, Assistant Registrar of Co-operative Societies.

The Department wishes to express its sincere appreciation to the many officers who, so unstintingly gave their time and energy during

Return of approved staff of the Department for the year 1 *September* 1945 *to* 31 *August* 1946.

	Administrative.	Clerical.	Professional. Higher.	Professional, Lower.	General.	Non-prescribed.
Secretariat	41	136	26	10	11	50
Veterinary Services	6	72	161	91	51	1,154
Agricultural Education and Research	2	21	104	39	43	57
Horticulture	—	12	28	49	6	15
Entomology	—	4	36	24	11	22
Soil Conservation and Extension	4	41	157	95	1	50
Botany and Plant Pathology	—	5	26	40	9	9
Chemical Services	1	9	72	32	6	53
Dairying	1	21	21	—	10	47
Economics and Markets	1	35	23	82	10	187
Guano Islands	2	7	—	—	30	28
Stellenbosch-Elsenburg College of Agriculture	1	11	48	8	25	11
Western Province Fruit Research Station, Stellenbosch	—	5	28	—	12	7
Agricultural Research Institute, Pretoria	1	5	32	4	10	10
Grootfontein College of Agriculture	1	7	16	7	10	2
Cedara College of Agriculture	1	4	14	2	10	2
Potchefstroom College of Agriculture	1	5	14	5	9	1
Glen College of Agriculture	1	5	16	6	13	5
Dehydration and Cold Storage	—	—	2	—	—	39
Total	64	405	824	494	277	1,749

the difficult year which has just passed. The loyal services rendered by them merit the appreciation not only of the Department, but also of the farming community and the numerous other sections of the population affected by the Agricultural Industry.

Principal Officers of the Department.

Dr C. H. Neveling, Secretary.
Mr. J. J. Adams, Under-Secretary.
Dr. M. M. S. du Toit, Under-Secretary.
Dr. F. J. van Biljon, Under-Secretary and Chairman of the National Marketing Council.
Dr. P. J. du Toit, Director of Veterinary Services.
Dr. G. v. d. W. de Kock, Deputy Director of Veterinary Services.
Dr. H. W. Turpin, Director, Agricultural Education and Research.
Dr. J. C. Ross, Director, Soil Conservation and Extension.
Dr. F. G. Anderssen, Chief, Division of Horticulture.
Dr. T. J. Naude, Chief, Division of Entomology.
Dr. R. A. Dyer, Chief, Division of Botany and Plant Pathology.
Dr. J. P. van Zyl, Chief, Division of Chemical Services.
Mr. S. J. de Swardt, Chief, Division of Economics and Markets.
Mr. L. J. Veenstra, Superintendent of Dairying.
Dr. J. S. Marais, Principal, Stellenbosch-Elsenburg College of Agriculture.
Prof. H. B. Davel, Director, Agricultural Research Institute.
Vacant, Director, Western Province Fruit Research Station.
Mr. T. L. Kruger, Superintendent, Division, Guano Islands.
Dr. G. M. Dreosti, Officer-in-charge, Dehydration and Cold Storage.
Mr. Rees Davies, Superintendent, Low Temperature Research Laboratory.
Mr. N. J. Eddy, Principal Accountant.
Mr. D. J. Seymore, Editor.

The Agricultural Library.

The Central Agricultural Library does not only supply literature to civil servants, but also offers two schemes under which farmers can avail themselves of the Department's Library.

Under the one scheme every farmer is enabled to become a member by the payment of a deposit of 10s. which is repaid when the farmer ceases to be a member. Under this scheme about 260 farmers became members during the past year, so that the total membership is now 1,400. This rapid increase in membership is mainly due to the fact that the library has abolished the annual subscription of 3s. which was formerly a condition of membership, as from 1 April, 1945.

The second scheme is intended for farmers' organizations, farm schemes, etc. In this case a deposit of £1 is charged but members are allowed a loan of 10 books, which may be retained for a period of 3 months. Under both schemes literature is sent to and fro post-free. During the past year seven members subscribed under this scheme so that 96 farmers' organizations and farm schools are at present members of the library.

During the past year, 810 complete works have been added to the collection of the library in addition to thousands of bulletins, journals etc. A total of 768 complete works was acquired by the central Agricultural Library for divisions of the Department, classified under the Dewey decimal system and issued to the various divisions. This number does not include standing orders for periodicals, etc.

During the past financial year, 26,501 publications were lent out to officers and farmer members—a total of 6,307 more than the previous year.

The increase in the membership of the Library and the figures of books loaned furnish proof of the growing appreciation among farmers and other members of the community of the value of agricultural literature, but the Department would be pleased to see an even more extensive utilization of the sources offered by the Agricultural Library.

Registration of Cold Stores.

In terms of a provision contained in the Livestock and Meat Industries Act (1934), all cold stores of over 2,000 cubic feet capacity and used for the storing of agricultural products, are subject to registration and inspection.

During the year under review 111 cold stores were registered as complying with the requirements of the Department that such places should be so equipped as to be suitable in every respect for the storing of products for human consumption. The Department is also continuing the inspection of cold stores already registered, in order to ensure that they are properly maintained, whilst advice is also rendered in regard to the improvement of unregistered cold stores in respect of which application for registration are still under consideration.

Registration of Fertilizers, Farm Foods, Dips and Stock Remedies.

During the registration year ended 31 December, 1945, 367 fertilizers, 731 farm foods, 223 stock dips and 381 stock remedies were registered in terms of the provisions of the Fertilizers, Farm Foods, Seeds and Pest Remedies Act (1917) and the regulations promulgated thereunder. On the 31 August 1946, the corresponding figures were 450, 854, 253 and 459 respectively. These figures indicate that the annual number of registrations is again increasing.

During the year ended 31 August 1946, 266 samples of imported fertilizers and farm foods were taken for analysis at the various Union ports and at Lourenco Marques. These samples all conformed to the requirements of the Act and the regulations issued thereunder.

Adulteration of Wine, Spirits and Vinegar.

During the year ended 31 August 1946, a total of 56 samples of liquor was purchased by the official buyer for analysis in terms of the "Wine, Spirits and Vinegar Act" (No. 15 of 1913).

The following table indicates the results of the analysis:—

Article.	No. of Samples Purchased.	Adulterated or below Standard.	Prosecutions (according to Samples).	Convictions (according to Samples).
Bamdy	51	48	37*	15
Whisky	1	1	1	—
Wine	2	—	2*	—
Gin	1	1	1	1
Vinegar	—	—	—	—
	56	50	41	16

* Prosecutions in respect of the following have not been finally disposed of:—Brandy 9, wine 2.

In addition to the samples purchased for analysis, the official buyer also examined approximately 35,000 other samples and tested about 6,000.

In the case of imported liquors, 563 samples were analysed, with the following results:—

Article.	No. of Samples.	Below Standard.	Importations Refused.
Wine	218	17	17
Brandy	49	5	4
Whisky	73	3	3
Gin	44	10	7
Rum	16	4	4
Liqueur	148	28	28
Mixed Spirits	15	—	—
	563	67	63

Control of Imports and Exports.

During the past 12 months the control over imports of agricultural products and requisites in terms of the Emergency Regulations, was considerably relaxed and the prohibition of imports in respect of a number of articles lifted. The majority of articles which are still being controlled, are those under international allocation owing to their being in short supply throughout the world, while naturally, import restrictions are still being imposed on articles the importation of which is subject to supervision even under normal conditions.

In so far as exports are concerned, control is being continued under the Emergency Regulations, in respect of a large number of articles, mainly those placed under international allocation or in respect of which the Union in her own interests, cannot allow free export.

The shipping position, too, is gradually improving—a fact of considerable importance to the agricultural industry because of the leeway which has to be made up in respect of the importation of farming requirements.

Railage Rebate Scheme.

The railage rebate scheme which has already been operative for a number of years in respect of certain types of transport and which was extended on a large scale on 20 March 1939, was reviewed during the past year by a Committee consisting of representatives of the Railway Administration and the Departments of Finance and Agriculture.

The agricultural products and livestock on which the rebate was applicable, may be divided into the following four main groups:—

(1) Livestock transported from drought-stricken areas to new pastures.
(2) animal feed dispatched to farmers in drought-stricken areas;
(3) livestock removed to markets and other centres; and
(4) miscellaneous products being dispatched by rail or road-motor service.

The terms of reference of the Committee were to make recommendations in regard to the advisability or otherwise of further grants of rebates, in view of the changed economic conditions of the country.

The Committee was constituted during October 1945, and submitted its report on all the aspects of the rebate scheme as it then existed, to the Minister of Transport on 26 March, 1946.

After considering the findings of the Committee, it was decided to withdraw as from 4 September, 1946, the temporary rebate on all products except maize and slaughter stock, which will be considered when the price of these products is fixed next year for the new season, and fertilizer which will be reconsidered at the beginning of the next financial year. The concessions in respect of the transport of livestock from and animal feed to drought-stricken areas still remain in force.

Seed Wheat and Fertilizer Loan Scheme.

Due to the serious shortage of wheat, which resulted in the imposition by the State, through the Wheat Industry Control Board, of stringent economic measures, it has been decided to make timely arrangements for the introduction of a loan scheme in respect of seed wheat and fertilizer in an endeavour to encourage an increased production. The wheat crops of the north-eastern Cape Province, the Orange Free State and the northern Transvaal were generally very disappointing during the previous season and many producers found themselves in a position where they could not even reap their seed requirements. In addition, they suffered such a set-back as a result of the drought, that they were not in a financial position to procure the necessary seed and fertilizer. In view of this state of affairs and the uncertain supply position which existed outside the Union, the Department was compelled to encourage maximum production and so reduce our import requirements.

Credit facilities were limited to an amount sufficient for acquiring 20 bags of seed wheat and 20 bags of fertilizer, repayable within a period of 12 months, with interest at the rate of 4 per cent. per annum. This scheme was made applicable to all districts where farmers were prepared to sow wheat and had reasonable prospects for a crop.

The scheme proved very popular and extensive areas were planted to wheat and, unless the absence of early rains in the northern areas causes the wheat to shrivel, it is presumed that the total yield will be considerably influenced by the relief scheme.

That our farmers have availed themselves of the scheme on an extensive scale is proved by the fact that the facilities were applied to 54 districts over the whole Union and that the Wheat Industry Control Board had to make considerable quantities of seed wheat available.

The Co-operative Movement.

During the year under review there has been no legislation directly affecting the co-operative movement, and there have been no important changes in the development of the movement which has rather been characterised by a steady growth, except in the case of co-operative trading societies, where the growth has been most marked.

At the beginning of the year there were 88 co-operative trading societies in existence with a total membership of 58,709, but the number of societies increased during the year to 116 with a membership of 65,769. Membership alone is quite unimportant in a study of the expansion of the movement but the trend in development is emphasized by the large number of additional societies registered during the year. These additional societies are mostly rural, and in each case the possibilities of successful operation were first considered and registration was sanctioned only after statistics had been furnished to indicate that the business prospects generally were such as to

warrant registration of the societies. The increase in the number registered is probably to a large extent due to the fact that farmers were well satisfied with the services rendered by their co-operative selling organizations, and that they consequently wished to extend this service to the field of buying.

The office of the Registrar of Co-operative Societies continues to function with difficulty due to a shortage of staff, which was, however, supplemented during the year and it is confidently expected that it will be possible to undertake at least some of the more urgent inspections of societies during the ensuing year.

Number and Membership of Societies.

At 30 June, 1946, there were 342 registered co-operative associations with a total membership of 226,763, representing an increase over the previous year of 33 in the number of associations and approximately 17,000 in membership. Of the societies in existence at that date, 226 were co-operative agricultural societies with a membership of 160,994, showing an increase of 7 in the number registered and about 10,000 in membership. The membership at the end of the previous year stood at 150,841. The percentage increase is high, and seems to indicate that farmers are well satisfied with the co-operative service which they now enjoy.

Business Statistics.

The net funds of all co-operative societies, represented by net share capital, reserves and unappropriated profits, have increased from £4,263,618 at 30 June 1939, to £8,576,060 at 30 June 1943, and to £11,023,206 at 30 June 1945, of which £10,057,912 represents funds of co-operative agricultural societies.

The total monetary turnover of all societies increased from £20,644,725 for the year 1938-39 to £39,573,685 for 1942-43 and to £53,678,168 for 1944-45.

The turnover of co-operative agricultural associations during 1944-45 amounted to £50,402,788 which shows an increase of £2,523,532 over the previous year. The recorded transactions undertaken by the co-operative agricultural associations comprised £43,537,449 in respect of produce sold, £6,644,848 in respect of farming requisites supplied, and £225,360 in respect of services rendered. The volume of requisites handled represents a substantial portion of the total increase in business done and amounts to approximately £1,500,000 out of a total increase of £2,500,000.

Protection and Export of Wild Birds.

During the past year 17 permits were issued in respect of 642 wild birds, with a view to enabling persons to sell, buy or to obtain or dispose of by barter, wild birds already in captivity. Apart from this number, 11 permits only were granted for the capture of a total of 795 wild birds, exclusively for zoological institutions in the Union, i.e. a total of 28 permits for 1,437 wild birds was issued under the provisions of the Wild Birds Protection Act (Act No. 22 of 1934).

During the same period the export of wild birds considerably decreased as can be seen from the fact that 7 permits were granted under the Wild Birds Export Prohibition Act (Act No. 6 of 1925) for the export of 198 birds only. At the request of the applicants one permit in respect of 2 birds was cancelled. All the birds were sent to acknowledged oversea zoological institutions.

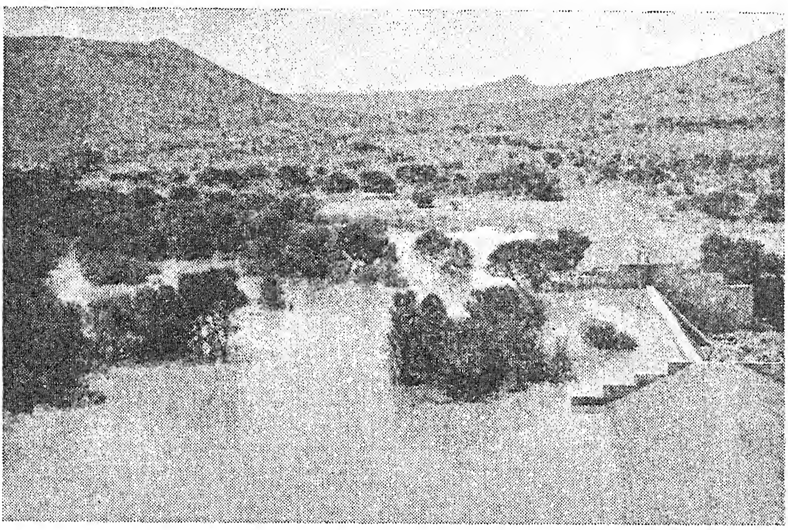
Conservation of the Agricultural Resources of the Union.

J. C. Ross. B.A., M.Sc., Ph.D., Director, Division of Soil Conservation and Extension.

As a result of Departmental re-organization effected towards the end of 1945, the Division of Soil Conservation and Extension was brought into being by grouping together the following Divisional activities:—

(*a*) Soil Erosion Services;
(*b*) Weed Eradication Services; and
(*c*) Extension Services.

The first two, concerned respectively with the administration of the various state-aided schemes for combating soil erosion and the application of the provisions of the Weeds Act of 1937, previously existed as sections attached to the now defunct Division of Soil and Veld Conservation, while the third was a constituent



A typical water conservation dam.

section of the former Division of Agricultural Education and Extension. The welding together of these three activities under one Division ensures proper co-ordination of services which deal with what are merely different aspects of the same fundamental problem, namely, the conservation of agricultural resources and the promotion of sound land use in farming.

The responsibility for the production of food and other raw materials, as well as for the conservation of our agricultural resources, rests in the first instance with the farmers of the country, but the State can and must help the farmer to use his land to the best advantage not only for himself, but also for the nation as a whole.

This is the motive underlying the creation of the new Division. It is in effect a field conservation and advisory service, the primary function of which is to maintain close contact with farmers all over the country and to co-operate with them in the development and application of farming systems and practices

which will lead not only to increased production, but also to greater stability of production, and at the same time guard effectively against deterioration of soil, veld and water supplies.

Decentralization on a Regional Basis.

The activities of this Division have been decentralized on a regional basis, for which purpose the Union has been divided into five main regions, each of which is controlled by a Chief Regional Officer, supported by a balanced team of senior conservation officials. This group of officials constitutes the organizing and planning committee for the region. It is given as much local authority as possible and carries out all the functions of the Division of Soil Conservation and Extension in the particular region. A prime requisite, of course, is that each region must be staffed with an adequate field personnel of extension officers—men who are in daily touch with the farmers and who do the actual work. Shortage of qualified and experienced personnel is the most critical issue at the moment. All possible steps are being taken to recruit and train men for this work, but this takes time and it is inevitable that some time will have to elapse before the peak development of soil conservation activity in the Union is reached.

It is a happy augury for the future that the people of the Union, urban no less than rural, have become markedly "conservation conscious" and are prepared to give their full support to a comprehensive national campaign of farming rehabilitation and soil conservation.

Main Provisions of the Soil Conservation Act.

The most outstanding achievement during the past year was the passing of the *Soil Conservation Act* (*No.* 45 *of* 1946). This Act is the response, on the part of the State, to the nation-wide demand that has arisen for better provision for combating soil erosion and for conservation of the natural resources of the country in its soil, veld and water supplies. The main feature of the Act is that it provides legislative enablement for full co-operation between the State and the farming community, with a view to securing the application of farming systems and practices which will husband these assets for the benefit of present and future generations, and at the same time enhance the fertility of the land and increase the production from farming. It also establishes the basis of the financial assistance which the State will be prepared to grant to farmers for this purpose. In view of the far-reaching implications of this Act, it seems necessary to give a brief synopsis of its main provisions.

In drafting the bill, the model bill prepared and published by the National Veld Trust, and also the laws of other countries relating to the conservation of natural resources and various Union laws on related subjects, were consulted. The draft bill was referred to and discussed at several meetings of the Agricultural Advisory Board, and was also considered fully by a Select Committee of the House of Assembly.

Although the Soil Conservation Act applies to all land, existing legislation administered by different Government departments has not been disturbed, except that certain provisions of the Forest and Veld Conservation Act (No. 13 of 1941), relating to soil conservation, have been taken over and embodied in the new Act.

The Act does not create a special department or other organization for giving effect to its enactments or for the execution of works which may have to be undertaken by the State. Responsibility for the administration of the Act and any regulations thereunder rests

in the first instance with the Department of Agriculture and, more particularly, with the Division of Soil Conservation and Extension. Where soil conservation works or measures are to be undertaken or applied to land under the control of other departments, or of provincial administrations, it will be the function of the respective department or administration to give effect to the provisions of any scheme embodying such works or measures.

Soil Conservation Board.

The Act provides for the establishment of a *Soil Conservation Board* consisting of the Secretary for Agriculture as chairman (with an Under-Secretary as alternate), the Secretary for Lands, the Secretary for Native Affairs, the Director of Irrigation, the Director of Forestry, the Director of Soil Conservation and Extension, and nine other members appointed by the Governor-General, five of the lastmentioned to be *bona fide* farmers appointed from a panel of ten names to be submitted by the South African Agricultural Union, and the remaining four to be other persons appointed on account of their special knowledge of or experience in soil conservation. The functions of the Board will be to advise the Minister of Agriculture and Forestry on all matters relating to soil conservation and to perform certain specific duties allotted to the Board under various sections of the Act. These duties include, inter alia, the preparation of soil conservation schemes which it may consider necessary, or which may be required by the Minister; the examination of draft schemes referred to it; the inspection at any time of the operation of any scheme; the consideration of applications for the establishment of soil conservation districts and of proposals regarding the establishment of soil conservation areas; the making of recommendations regarding the expropriation of land, suspension of rights, or exemption from suspension or termination of suspension in a soil conservation district or soil conservation area; and the expropriation of land outside such districts or areas for purposes of the Act. The fact that representation is given on the Board to various State departments concerned with different aspects of land use and soil conservation, should ensure proper co-operation and co-ordination of effort among these departments.

Soil Conservation Districts.

The Act also makes provision for *soil conservation districts* and *soil conservation areas*. The former can originate only on the volition of the majority of owners of land in the area concerned, who must define the proposed area and furnish a list of the included properties, with the names and addresses of the registered owners and occupiers (inclusive of "bywoners"), and also give the reasons for the proposed establishment of the soil conservation district. Soil conservation areas, on the other hand, are proclaimed by the Governor-General, on the recommendation of the Board, in instances where the conditions demand action, but where voluntary action on the part of the owners of the land concerned is not forthcoming, or where it is evident that the necessary reclamation and conservation works will have to be undertaken mainly by the State at public expense. Subject to the payment of compensation, land may be expropriated where such action is deemed necesary for the purpose of reclamation, or for the prevention of soil erosion or sand drift, or for the protection of catchment areas or the conservation of water sources, and irrespective of whether the land concerned falls inside or outside a proclaimed conservation district or area.

District Committees.

A *soil conservation district committee* has to be established in respect of every soil conservation district, and shall consist of such number of members as the Minister may determine in each case, at least two-thirds of these to be occupiers of land carrying on *bona fide* farming operations in the district. The farmer members are elected by the owners of land in accordance with a procedure to be prescribed by regulation. The remaining members are appointed by the Minister and will, whenever practicable, include at least one technical officer of the Department to assist the committee, particularly with regard to the preparation of soil conservation schemes.

A district committee is required to prepare a soil conservation scheme for all land in its district and to obtain each owner's consent or his objections thereto. After due notice by the Minister, the scheme will be served on the owner concerned and applied to his land, and the committee will be required to take such steps as may be necessary to ensure the proper carrying out of the provisions of the scheme.

Application of Soil Conservation Schemes.

A *soil conservation scheme* is a comprehensive plan designed for the reclamation of eroded land or for the prevention of soil erosion, or, generally for the conservation, protection and improvement of soil, veld and water supplies, and includes all necessary measures for the promotion of sound systems and methods of land use. In order to attain this broad object, a scheme may include provisions relating to the works which are to be undertaken by the State and by the owner, respectively; the order in which the works must be constructed; the labour, equipment and material to be supplied by the State or by the owner; the soil conservation measures to be applied to the land and the order in which they are to be applied; the manner in which land has to be prepared for the growing of crops, including provisions regarding rotation of crops or strip-cropping; the temporary withdrawal of defined portions of land from cultivation or grazing; restrictions regarding the kind and number of livestock which may be grazed for specified periods on any part of the land; the occupation of the land by lessees, native labour tenants, squatters or servants; the prevention, control and extinguishing of veld and forest fires; or the treatment and management of forests and plantations, including the disposal of slash, debris or waste.

A scheme will generally allow sufficient elasticity to permit of its being carried out in a practical manner under varying conditions of climate or under varying circumstances. In addition to this, the Minister can, after consultation with the Board and the district committee concerned, amend the provisions of any scheme or grant exemption from any provision thereof, if he is satisfied that strict compliance with that provision will cause undue hardship to the owner or occupier concerned.

As regards land not falling inside a soil conservation district, the owner may himself, with or without technical assistance, prepare a soil conservation scheme and submit it to the Minister with the request that it be applied to his land. The Minister may reject the scheme or may agree to it, with such modifications as may be agreed upon between the Minister and the owner. The Minister may also, on the recommendation of the Board and after due notice to the owner concerned, cause a scheme to be prepared and applied to any land situated outside a soil conservation district.

An owner of land is bound to carry out the provisions of the

scheme applied to his land; in the event of his failure to do so, the Minister can, after consultation with the district committee, take such steps as may be necessary to carry out the provisions of the scheme and recover the cost thereof or any portion of such cost from the owner.

In order to assist an owner of land to construct approved soil conservation works or to carry out approved soil conservation measures on his land, the Act authorizes, subject to conditions to be prescribed by regulation, the payment of *subsidies* or *grants* to the owner concerned, or the granting of *advances* to such owner, with an appropriate *rebate* on the total sum repayable.

An additional provision of the Act is that the Minister is authorized at any time to take steps for the construction or maintenance on any land of such soil conservation works as he may, on the recommendation of the Board, consider necessary. The cost of works so undertaken may be charged entirely to the State, or entirely to the owner or owners of the land which is beneficially affected by the works, or partly to the State and partly to such owners. Where the owner or owners concerned are dissatisfied with the amount of costs charged to them, the matter in dispute will be decided by a board consisting of the local magistrate and two other persons, one to be appointed by the owner or owners and the other by the Minister.

For the purpose of *public demonstration or research* in matters relating to soil, veld or water conservation, the Department may at public expense construct any soil conservation works or apply any soil conservation measures on private land subject to the approval of the owner of the land and subject also to such conditions as may be agreed upon between the Minister and the owner.

Fire-protection Committees.

In order to make better provision for the protection of veld from fire or for extinguishing veld fires, the Act provides for the establishment of *fire protection committees*, whose functions are to be prescribed by regulation. The establishment of such committees and the areas assigned to them will be notified as necessary by the Minister in the *Government Gazette*.

The foregoing description will serve to indicate the comprehensive nature and wide scope of the new Act. It provides for every possible contingency that is likely to arise in connection with the national campaign of soil conservation and farming improvement now envisaged. All experience goes to show that the farmers of the country are eager to co-operate with the State in order to bring the campaign to a successful conclusion, and that coercion or compulsion is likely to be called for only in exceptional cases. For this reason it is confidently expected that the dominant approach to the problem from now on will be via the medium of soil conservation districts established on the volition of the farmers concerned and run essentially by the farmers themselves.

Notwithstanding the current shortages of personnel, labour, motor transport, machinery and equipment generally, as well as various difficulties experienced in the re-organization of the Division, it is pleasing to be able to report considerable useful progress during the year under review as regards soil conservation activity in the field. A summarized account of the activities of each section administered by the Division will be found under the appropriate heads.

Sectional Activities.

A. Soil Erosion Control.

In 1933 several schemes were instituted by the Government in order to assist owners and occupiers of land in the construction of small dams and anti-erosion works. The object of these schemes was to encourage the farming community to conserve water for both stock-watering and irrigation purposes, and to devote more attention to soil-erosion control.

As a result of the war and the consequent need for curtailment of expenditure, the granting of further facilities under these schemes was suspended in June 1940. In April 1942, the facilities were, however, partially restored and have continued in modified form up to the present date There has been a tremendous increase recently in the number of applications received, due most probably to the return of men from the forces and the prevailing demand for increased agricultural production.

Under these schemes, no fewer than 24,811 dams, valued at £2,803,819, were completed up to 31 August 1946. Completed anti-erosion works have a total value of £407,241, which again brings to light the striking fact that farmers have shown a marked preference for the construction of dams which are intended primarily for the conservation of water and which are only of indirect value in soil erosion control. The same disproportion is also apparent in the estimated value of outstanding works, viz., £2,167,038 in the case of dams and £450,381 in the case of soil erosion control works.

A comparison of the average monthly figures for the years 1944-45 and 1945-46 in regard to "dams approved" and "dams completed" indicates very clearly that the amount of field work has almost doubled in the past year. Although the corresponding figures for soil erosion works do not show any marked increase, it may be mentioned that a steadily increasing volume of work of this nature is being done outside the schemes, i.e. without claims for State assistance. Apart from this, it should be noted that the surveying of contour systems, which represent the greater part of the usual soil-erosion works, requires much more field work per unit of cost than is involved in the surveying of dams.

Notwithstanding the fact that the Division has succeeded up to a point in obtaining additional personnel, the ever-growing waiting lists give clear evidence that the demand for surveys cannot be coped with and that the field staff will have to be strengthened considerably in order to give the farming community the service it requires even under these limited schemes alone. It may be noted that "outstanding" dams and erosion works, which have accumulated since the year 1933, amount to more than 50 per cent. of the approved total.

The construction of masonry structures suffered a severe setback during the year under review as a result of the shortage of cement and of the steel wire used for reinforcing purposes. In addition, most of the necessary machinery, such as windmills, engines and pumpheads, has been and still is in short supply. It must be presumed that many of these structures had a high priority in planned farm extensions, but that they had to be postponed in favour of more easily executable soil structures. This may in a way explain the tremendous increase in the number of applications for dams. The lack of machinery such as tractors, graders, bulldozers and ditchers, on the other hand, may be responsible for the continued slow progress in soil erosion works, such as contour-ridging and donga reclamation. Although such heavy machinery is indispensable if

fast work is to be done, it has been proved that well-shaped contour banks can also be built by systematic ploughing only, thus eliminating the danger of excessive capital investment. This ploughing method is gradually gaining popularity.

The great value of these schemes lies in the fact that they have to a large extent helped to make the farming community conscious of two important factors intimately affecting the agricultural industry. The first is the benefit to be derived from water conservation and the second, and more important, is the necessity for controlling soil erosion.

In this country, where the destruction caused by soil erosion has already reached vast proportions, it is clear that *reclamation* measures will have to play a very big rôle for many years, but in the long run *prevention* of erosion will have to be regarded as the most important line of attack on the problem as a whole. Full cognizance has been taken of this fact in the "conservation scheme" approach envisaged under the Soil Conservation Act. As this new method of approach gains ground, it may be expected that the need for the existing soil erosion schemes, with their restricted scope, will gradually fall away, and the same applies in respect of the *silo scheme*.

This scheme was inaugurated in 1936 with a view to encouraging farmers to devote more attention to fodder-conservation, notably in the form of ensilage. The scheme originally applied to maize growers only, but the facilities were later extended to all farmers in the Union, and the Department paid a bonus of 25 per cent on the final valuation of silos built under the scheme. During the past year an amount of £4,740 was paid out in bonuses.

Conservation Areas.

The war period 1939-45 marks the period of the awakening of the people of South Africa, both rural and urban, to the facts concerning soil erosion and the need for conservation farming. Before 1939 these matters were considered seriously only by a minority of farmers and a very small percentage of townspeople. By the end of 1945, however, large numbers of both farmers and townsfolk were clamouring for action to be taken to secure the rehabilitation of areas damaged by soil erosion and generally to ensure the conservation of the agricultural resources of the country. The colour film "South Africa in Danger", shown in many parts of the country, played an important part in arousing the interest of the people and especially of city dwellers.

A particularly significant development during the war period was the passing of the *Forest and Veld Conservation Act*, (No. 13 of 1941), which embodied the first attempt to provide effective legislation to deal with soil erosion and related problems. Under this Act the Government is empowered to proclaim as a "conservation area" any area of land which is considered, in the national interest, to warrant reclamation or conservation at public expense, together with such additional land as may be required for the proper conservation of the area in question. When a conservation area has been duly defined and proclaimed under the Act, the Government is empowered in respect of *any land within the area*—

(*a*) to expropriate such land, subject to a right of pre-emption remaining in the owner or his successor in title; or

(*b*) to suspend for a specified period any or all of the owner's rights in or over such land, and to enter upon and take possession of the land for the purpose of conservation; or

(*c*) to grant exemption from suspension of rights to any owner who undertakes to carry out at his own expense

such conservation works as may be prescribed: this exemption may be terminated at any time, subject to three months' notice, and may be withdrawn without notice if the owner fails to comply with the terms of his undertaking; and

(*d*) to restore in due course any rights that may have been suspended, subject to payment by the owner of a sum representing the improved value of the land after reclamation, and further subject to such conditions regarding the future occupation and use of the land as the Government may deem fit to impose, which conditions shall attach to the land and be noted on the title deeds: in the event of the owner's failure to pay the amount due within a stipulated period, the land shall forthwith vest in the Crown, subject to payment of compensation equal to the value of the land before reclamation plus the value of improvements effected in the meantime by the owner.

It is clear that this Act gives the Government wide powers to enforce the reclamation and conservation of all land falling within a proclaimed conservation area. In actual fact, however, the policy has been to keep the " compulsion " aspect in the background and to make every attempt to secure the goodwill and co-operation of the landowners concerned.

Thus, in the areas so far proclaimed, expropriation of land has been restored to only in extreme cases; that is, where the national interest demands the suspension of farming operations on certain farms or portions of farms for an indefinite period. In such cases the landowners concerned are notified in writing. Should no agreement be arrived at as regards the compensation offered, the amount is fixed by an arbitration court consisting of the local magistrate, a representative of the owner and a representative of the Minister of Agriculture. Notice must be given to the landowner concerned not less than three months before expropriation takes place, but the Government is entitled to enter upon and take possession of the land within a period of six weeks from the date of service of the notice. The land thus expropriated is reclaimed at the expense of the State. In the event of the land being again released for farming at some future date, the dispossessed owner or his successor in title has the first right of purchase.

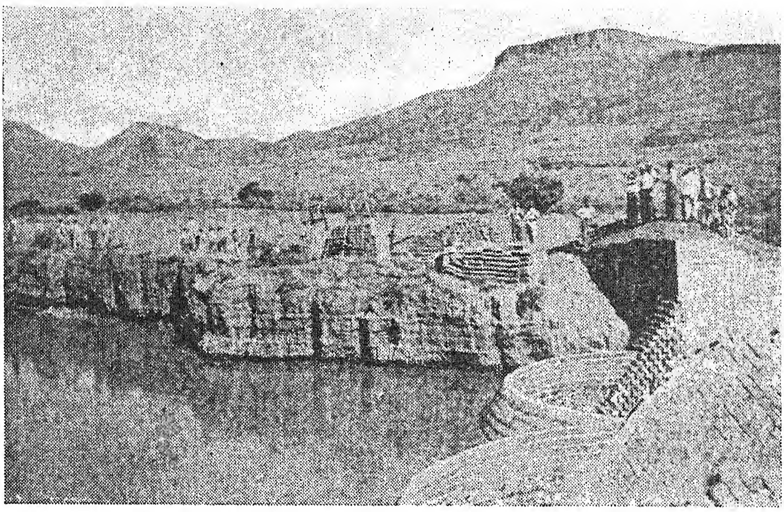
Similarly, the policy up to the present has been not to make use of the power of suspending an owner's rights in or over his land, unless all other methods of approach fail. In place thereof, the landowners are invited to co-operate with the Department in the application to their properties of reclamation and conservation plans that will ultimately achieve the objectives aimed at in the proclamation of a conservation area. To this end, special subsidy schemes have been called into being: landowners who carry out the prescribed works and measures at their own expense receive a cash bonus equal to 50 per cent. of the final valuation thereof, subject to a specified maximum; where ready cash is lacking, substantial loans are granted on very easy terms, the amount repayable being reduced by a sum equal to the bonus calculated as above.

A further important feature of the present conservation area approach is that the Department itself accepts full responsibility for the construction of certain works of a more difficult or costly nature. These are works which form an essential part of the whole programme of reclamation and conservation for the particular area and which cannot be regarded as the responsibility of particular individuals.

As far as soil conservation legislation is concerned, the *Forest and Veld Conservation Act* has now been replaced by the new *Soil Conservation Act* (No. 45 of 1946), the main provisions of which have already been referred to. The latter Act incorporates the relevant provisions of the former Act, but it also provides for various alternative methods of approach and covers a much wider field than the older Act. The new Act, however, has come into operation only very recently, and in the meantime several conservation areas have been proclaimed under the former Act. A brief description of the existing conservation areas follows.

(a) The Vlekpoort Conservation Area.

The upper reaches of the Vlekpoort River valley, comprising approximately 80,000 morgen, were the first to be proclaimed as a conservation area. The proclamation appeared in the *Government Gazette* of 22nd August, 1941.



A conical dam to catch silt (Vlekpoort).

Veld deterioration and erosion had reached an advanced stage over a great part of this area. A large proportion of the silt deposited in Lake Arthur was derived from farms in the Vlekpoort Valley, where extensive donga formation had already taken place and was progressing at an ever increasing rate. For these reasons this area was chosen as the first to receive special attention.

Along the lines already indicated, a method of approach was evolved which aimed at securing the whole-hearted co-operation of all the landowners concerned, so that by their efforts, combined with those of the Department, the area might be reclaimed in the shortest possible period and conservation farming methods introduced to ensure the improvement of the veld and the reduction of erosion to a minimum. The main features of the work done at Vlekpoort are as follows:—

Works Undertaken Departmentally.

Expropriated land.—The farm Uyenhoek, hardly a single morgen of which was unaffected by erosion, was the first to be acquired and served as local headquarters for the conservation officials seconded to the area. Work here commenced early in 1942. A comprehensive programme of reclamation work was started and gradually extended

to certain adjoining farms which were subsequently acquired, viz., Sonneskyn, Spitskop and Sarnia, and the near-by farm Caskieben, which consisted mainly of mountain veld infested with renoster and harpuis bush.

In the upper portion of the valley the properties of five owners have been taken over and those of three more owners are being acquired, while one farm at the lower end of the area is also being acquired. This will complete the land-buying or expropriation programme.

A large amount of reclamation work has been carried out on these farms and the major portion of the works on the Uyenhoek group of farms has been completed. Apart from the ordinary type of earthen embankment a number of different types of masonry and concrete structures have been and are being erected. Some of these structures are comparatively cheap and promise to reduce reclamation costs appreciably.

A vast amount of silt has already been retained on the farms concerned as a result of these works. Grasses and other plants are being tried out on these silt beds. So far the locally obtained "fluitjies" reed (*Phragmites communis*) is the most promising. It is remarkably hardy, binds the silt very thoroughly and spreads rapidly, thus inducing further deposition of silt as the reed spreads upstream. This reed has now been planted on many silt deposits.

During the past two years some power machinery was obtained, which made it possible to increase the number of gangs employed, especially as ex-volunteers became available for posts of foremen and drivers. Earth-moving work could thus be expedited, but unfortunately the scarcity of cement is still greatly retarding masonry and concrete work.

Although a large amount of work has been done with animal draft, it is quite clear from experience at Vlekpoort that heavy machinery will have to be employed on a large scale if satisfactory progress is to be made with the vast amount of work still to be tackled over the country as a whole. It is hoped that the necessary machinery and implements will become available in the near future.

Due to scarcity of fencing material, it has not been possible to complete the fencing programme on the farms mentioned. Nevertheless, stock was completely withdrawn from those portions where erosion had advanced furthest and where the veld had been damaged most, especially against the mountain slopes. The recovery of severely denuded veld has been disappointingly slow, even where such veld has been completely spared for two or three seasons. It must, however, be pointed out that the past two summer seasons have been very severe, in that very high temperatures prevailed, while little rain fell during the months best suited for rapid growth. But notwithstanding these adverse conditions, veld which had not been damaged too severely and where a fair amount of the topsoil still remains in place, has shown an encouraging improvement. It has thus been demonstrated very clearly that timely measures must be taken to reclaim the veld that has been mismanaged and is now on the way to complete denudation.

Attempts have been made to hasten the revegetation of denuded areas by sowing a variety of grasses, but little success has been achieved so far. *Cenchrus ciliaris* and *urochloa* have survived and may serve the purpose when better seasons are encountered. The local hardy *creeping saltbush* is also giving promise, while even a weed, the *Russian tumble-weed* which is extremely hardy, is being used to advantage as a pioneer on some of the hard, bare brak places where nothing else will grow.

On the farm Caskieben, 1,000 morgen have been cleared of renoster and harpuis bush during the past year, but due to adverse climatic conditions very little veld improvement is noticeable as yet.

Weirs.—It was decided that a number of weirs of suitable type must be erected at strategic points across the Vlekpoort River and its main tributaries. The object aimed at is to induce deposition of silt above the weirs and thereby raise the level of the beds of the rivers and of the dongas in the immediate vicinity, to raise the water table, to reduce the drainage of the neighbouring countryside and to prepare the area generally for the application of appropriate veld reclamation and conservation projects.

The Department of Irrigation agreed to undertake the construction of the larger weirs and during the past year completed the fifth weir across the Vlekpoort River on the farm Ebenezer. The sixth weir is now in course of construction.

River betterment works.—These include works and structures designed to reduce the undermining and scouring of river banks, to induce the rivers to flow along the least dangerous course, to eliminate dangerous bends, and generally to stabilize the banks along properly confined water courses.

Palisades and groynes constructed with the aid of 8-ft. wooden poles driven 4 ft. into the river bed and firmly tied together and anchored, could not withstand the force of the water and were torn out and washed away. Some concrete structures have since been erected and others are in the course of construction.

Reclamation of main drainage channels.—These are large and well-developed donga systems, often miles in length and seriously affecting the stability not only of particular farms, but of the area as a whole. Their reclamation, in the nature of the case, is essentially work which must be undertaken at State cost. The building of substantial structures in the main channels is necessary: a number of these have been completed and others are in course of erection.

"Major" works on private land.—Under this head are included works which must be undertaken on many farms for the benefit of these particular farms, but which, by reason of their difficult nature or high cost, or both, cannot be undertaken by the landowners concerned. Such works are undertaken by the Department, and the landowners whose properties are beneficially affected are in due course required to contribute towards the cost on the basis set out in section 5 (4) (*c*) of the Forest and Veld Conservation Act, 1941, [now section 27 (3) (*c*) of the Soil Conservation Act, 1946]. It is to be noted that the undertaking of this work by the Department generally involves the temporary suspension of the owner's rights over the particular area concerned.

Before at least a few tractors became available it was virtually impossible for the Department to do anything under this head, but during the past year five well-equipped gangs have been assembled and the work is now proceeding.

Works Undertaken by Landowners.

The works undertaken by landowners, often referred to as "minor" works, are supplementary to the abovementioned works undertaken by the Department and embrace various mechanical works and biological measures designed to promote sound land use and the development of a stable farming system in respect of every farm. These works include soil erosion control works, farm dams, silos, adequate provision of grazing camps and all necessary measures for the reclamation and conservation of the soil, veld and water supplies, as also measures for ensuring the production and storage of increased fodder supplies.

In every case the plans and specifications are prescribed by the Department in consultation with the owner. Upon satisfactory completion of the work, the landowner receives a generous bonus on the valuation as determined by the Department, subject to the proviso that he must agree to maintain the works and to continue to apply the prescribed soil and veld utilization methods. Alternatively, as explained earlier, he may avail himself of the liberal loan facilities provided in which case an amount equivalent to the bonus he would have received (had he carried out the whole programme of work at his own cost) is applied as a rebate on the sum repayable to the State.

Most of the landowners have made very good use of the facilities offered and have done a considerable amount of very useful work, although progress generally is not as rapid as it might be. During the year under review 92 works of various descriptions have been surveyed on 26 different farms: of these, 58 have been completed and the remainder are in progress.

The farmers are particularly interested in the erection of fencing to sub-divide their veld property into camps, but little could be done in connection with this most important phase of the work, as fencing material is still practically unprocurable.

(b) The Tarka Conservation Area.

The Vlekpoort Conservation Area constitutes only about one sixth of the whole catchment area of Lake Arthur. Conditions in the whole catchment are alarming. Overstocked and denuded veld, accompanied by advanced donga and sheet erosion, are of general occurrence. Useless vegetation such as renoster, harpius and bitter karoo bush, as well as thorn bush and prickly pear, has already colonized portions of many farms.

The only lasting solution to the problems that have already been created is to be found in the reclamation of the soil and veld already damaged and the development and application of suitable farming systems, which together will result in a progressive improvement of farming conditions and permanent conservation of the soil, veld and water supplies. In order to achieve these objectives, the whole catchment area, comprising approximately 500,000 morgen, has recently been proclaimed a conservation area. This implies that the scheme for the Vlekpoort Conservation Area, already discussed, has now been extended to the whole of the catchment of Lake Arthur, but with two important additions:

(i) *Eradication of useless bush.*—In view of the special nature of this work, the technical difficulties associated with it and the special equipment required, the Department will in many cases be compelled to undertake the eradication of useless bush and prickly pear. The landowner will be required to enter into an agreement to contribute 50 per cent. towards the cost in the same manner as, and subject to the same conditions under which, loans are repayable. It should be noted that provision has also been made for landowners, where possible, to carry out the work themselves under the bonus scheme.

(ii) *Minor works undertaken by the Department.*—In cases where the landowner, because of labour shortage, or difficulties in regard to supervision, or scarcety and high prices of implements, finds it difficult or impossible to carry out the prescribed programme of minor works himself, he may request the Department to carry out this work on his behalf. Should the Department deem it

expedient to accede to his request, the landowner will be required to pay to the State an amount representing 50 per cent. of the valuation of the completed works. This payment is subject to the same conditions applying in respect of loans and is recoverable in the same manner.

(c) The Drakensberg Conservation Area.

An area comprising approximately 1,000,000 morgen of land, bounded by the Tugela and Mooi Rivers in Natal, was proclaimed as a conservation area in the *Government Gazette* of 14 April, 1944.

In this area the application of unbalanced farming systems, as well as various land-use malpractices, including the pernicious labour-tenant or " labour farm " system, and other factors have led to extensive land deterioration, with the result that erosion of every type is rife.

These conditions have led to widespread denudation of the veld and depletion of soil fertility, and have had such a profound influence on the stream flow of the local rivers that, during the drought of 1933, most of the rivers of this once well-watered area were practically dry. If this state of affairs were allowed to continue, these once permanent rivers would inevitably become dry beds in the winter and roaring torrents with every heavy rain in summer, and ultimately all farming in the area would be jeopardized.

For these reasons the Government decided to take action to remedy the situation and, as a first step to this end, the area concerned was proclaimed a conservation area. With a view to ensuring effective reclamation and conservation of the proclaimed area and assisting farmers to apply correct farming systems in order to stabilize farming in the area, a scheme very similar to that described for the Vlekpoort and Tarka Conservation Areas has been inaugurated.

In the early stages progress was very slow, due to shortage of staff, as well as of essential machinery and implements. These conditions have now improved somewhat and better progress is being made, although it is still far from what it should be. The main features of the work completed and in progress are as follows:—

Works Undertaken Departmentally.

Under the *expropriation* programme three adjoining farms, which form the headwaters catchment area of the Blaauwkrantz River, have been acquired with a view to safeguarding this important water source. Immediate attention was given to reclamation of the extensive dongas on these farms. During the year under review 32 concrete and stone masonry barriers, as well as 20 earthern embankments, were constructed to this end.

A heavy tractor with bulldozing equipment has been used very effectively for sloping the perpendicular sides of dongas. These are then covered with a layer of grass, which is cut at a stage when the seed is ripening. Most encouraging results are being obtained, for the seed germinates well and the indications are that the banks will soon become densely grassed.

The recovery of denuded veld after one summer season of sparing, notably against the mountain slopes, has been very much more encouraging than in the Vlekpoort area, where the rainfall is lower and more erratic, and soil conditions are poorer.

Major works have been undertaken at State cost on five private farms. Most of this work has been completed and here, too, results are being obtained more quickly than at Vlekpoort. Denuded areas are effectively and quickly revegetated by fencing them off and retarding the rapid drainage along dongas by means of barricades.

The fencing in of vleis where dongas are developing, coupled

with the use of concrete, masonry or earthern banks, is also proving an effective method for the reclamation of such vleis and their restoration to the marshy sponges they should be.

A good deal of attention has been given to *bush eradication*, as the thinning out of bush in the thornveld area is an essential preliminary to the restoration of such veld and the combating of erosion. An air-compressor, equipped with various types of chisels, is being tried on this work. Over 100,000 trees have already been felled and it would appear that with some further improvements this method of eradication is likely to prove successful. The felled bush is used to great advantage for covering bare patches in the veld, thereby inducing revegetation, and also for the reclamation of small dongas.

Works Undertaken by Landowners.

During the year under review 45 farmers applied for assistance under the subsidy or loan-plus-rebate schemes referred to earlier, in order to enable them to carry out approved programmes of minor works on their farms. This brings the total number of applications so far received to 125. It has not been possible to deal with all these applications, for reasons already indicated. In actual fact, detailed plans and specifications have been prepared for only 32 applicants so far; a good deal of this work has been completed and the rest is in progress.

(d) The Heuningklip River and Tygerberg Conservation Areas.

These two areas have been proclaimed very recently as conservation areas, and similar facilities are being made available as in the case of the other areas. Work in these areas has not yet commenced.

The Heuningklip River Conservation Area comprises approximately 50,000 morgen in the Sterkstroom district, eastern Cape Province, and the Tygerberg Conservation Area roughly 10,000 morgen in the upper portion of the catchment of the Elsieskraal River in the Bellvile district, near Cape Town.

B. Weed Control.

Prickly Pear Eradication.

The Division is happy to be able to report that the prickly pear eradication campaign in the eastern Cape Province is now virtually completed. Prickly pear felling was started on 30 August 1943, as an experiment. Italian prisoner-of-war labour was utilized. This labour was dispensed with on 1 April 1944, as it was found uneconomical, and native labour was substituted. The scheme was started at Cookhouse and was later extended to Graaff-Reinet. The experimental felling was found to be so successful that it was decided to extend felling operations to cover all prickly pear in the eastern Cape Province area which had been reserved for the biological control of prickly pear.

Two new felling schemes known as the "Departmental felling scheme" and the "subsidy felling scheme", were formulated and came into operation in place of the experimental felling scheme on 8 June, 1946. Under these schemes the following areas of prickly pear have been felled.:—

Experimental felling scheme..................	32,000 morgen.
Departmental felling scheme....................	147,786 morgen.
Subsidy felling scheme..........................	246,202 morgen.
TOTAL	425,988 morgen.

The average labour cost per morgen under the Departmental scheme, which can be taken as the basis of calculation of costs for both schemes and is the figure on which the contribution of the landowner is based, worked out at 6s. 2d. per morgen.

The results achieved in almost all areas dealt with have been most gratifying, and it can be stated confidently that the prickly pear menace in all the more important farming areas is now a thing of the past. There are, however, areas where, owing to climatic conditions, the fungus disease Empusa and certain cochinellid parasites have thrived at the expense of the cochineal, and where the felling method of eradication consequently could not be used or has not been wholly successful. In the areas in which prickly pear has been felled there are fortunately very few places where severe regrowth has occurred or can be expected. These places are being kept under close observation.

For the reasons stated, the felling method could not be employed in the following areas: the districts of Humansdorp, Port Elizabeth, Alexandria, Bathurst and the coastal portion of Uitenhage. In these areas it is proposed to liberate the prickly pear parasite *Cactophagus*, which is at present being bred up at the Uitenhage Cactoblastis Station, in the hope that this insect will be able to deal effectively with the prickly pear in the areas mentioned.

It is proposed to terminate the prickly pear felling schemes on 30 June 1947. The present area reserved for the biological control of prickly pear will be reduced to include only areas mentioned above in which the *Cactophagus* insect will be used to control pear. In the rest of the Union prickly pear will then become a proclaimed weed under the Weeds Act and any owner of infested land who has not availed himself of the facilities offered under the felling schemes will be compelled to eradicate prickly pear occurring on his property at his own expense.

Consideration is being given to the question of extending the scope of the felling schemes, which are at present applicable only in the biological area, to certain areas of the northern Cape Province and southern Orange Free State which fall outside the biological area. In these areas cochineal has developed so satisfactorily that it is considered that the felling method of eradication may be applied. It is hoped to induce all landowners in these areas to make use of the subsidy felling scheme, in order to avoid the necessity of having to transfer labour gangs from the eastern Cape Province.

Considerable quantities of prickly pear occur in the Ciskei, and these infestations are a menace to adjoining districts. As the Ciskei is all native territory, administered by the Department of Native affairs, it has not as yet been possible to undertake any eradication there. Representations have, however, been made to that Department in respect of this pear, and it has been suggested that this Division undertake eradication under the departmental scheme.

Spineless Cactus.

A serious situation has arisen in many parts of the country in regard to spineless cactus. Cochineal has now spread to practically all parts of the Union and has attacked many spineless cactus plantations, the indications indeed being that most spineless cactus plantings in the country will in course of time become infested.

Protection can be afforded (*a*) by removal of all scattered growths of pest pear which the cochineal uses as stepping stones to move from place to place, and (*b*) by establishing a method of controlling

cochineal in spineless cactus. In connection with (*a*), it must be stated that field officers have been instructed to apply the Weeds Act more strictly in respect of prickly pear, and the campaign against prickly pear will be intensified after 30 June next, when the felling schemes have been terminated and the major portion of the present biological area has been abolished. As regards (*b*), the Division of Entomology is experimenting with methods of controlling cochineal and has devised a D.D.T. emulsion which is promising.

Prickly pear has long been a major menace over a large area of the country, but is now fast disappearing. It is hoped to have the remaining growths eradicated in the relatively near future, to ensure the protection of growers of spineless cactus, and to eliminate entirely the threat of any part of the country becoming infested with pest pear in future.

Other Noxious Weeds.

During the past year the control of noxious weeds has been vigorously prosecuted in all parts of the country, although lack of staff and the consequent huge areas which had to be allocated to each Weed Inspector have limited the progress made. Generally speaking, however, a distinct improvement as regards the majority of the proclaimed weeds can be reported in most areas. Inspectors report that the continued propaganda made in respect of weed eradication is gradually having effect.

State assistance was again provided during the year in respect of portions of the Vaal River and a number of badly infested rivers in the Northern Transvaal. It is not yet possible to determine when weed eradication along these rivers will have been brought to a stage where State assistance will no longer be necessary and the onus of maintaining the river banks free from weeds can be thrown on the riparian owners.

Control of *dodder* in the lucerne seed-producing areas has been intensified, with good results. The seed regulations promulgated in the course of last year are undoubtedly having excellent results, from the dodder eradication point of view. It has become increasingly clear, however, that regulations prohibiting the sale and transport of lucerne hay infested with dodder are urgently necessary in order to prevent the spread of this serious weed.

The spread of *upright star burr* in the bushveld areas of the Transvaal is causing concern. Owing to the abundance of seed formed by this troublesome weed, the drought resistance it exhibits, and the fact that its seed germinates readily with light showers of rain, it has invaded large areas. It is a weed which normally invades only ploughed lands or disturbed ground, but has been found to invade large tracts of veld during the past two years. This is largely due to gross over-stocking coupled with severe drought. The position has become so serious that a special campaign is being undertaken to ensure control of this weed.

During the course of the year a survey of *hakea* infestations in the south-western Cape Province was undertaken. The survey revealed a very serious state of affairs and consideration is being given to the inauguration of a special scheme to bring this weed under control.

No active steps to combat *jointed cactus* have been taken during the year, although the situation has been kept under observation. Considerable regrowth of jointed cactus has taken place and the general position in respect of this weed can be described as deteriorating rapidly.

Two new plants have been proclaimed weeds in the course of the year, viz. *Lantana camara*, also known as *tickberry*, and *cenchrus viridis* or *burr grass*. Lantana is becoming a serious menace in certain coastal districts of Natal and has already invaded some 25,000 acres of valuable land in those parts. Burr grass, a newcomer to South Africa, and as yet known to occur only in a limited area at Durban, is a dangerous weed and it is felt that it must be controlled at the outset. Active steps to ensure eradication of these weeds are being taken.

Bush Eradication in Zululand.

At the request of the Division of Veterinary Services, this Division has undertaken an extensive bush-clearing campaign as part of the various measures now being adopted to combat nagana in Zululand and adjoining areas.

Briefly the work entails: (*a*) the clearing of all bush, thicket and trees in barriers two miles wide around the game reserves in Zululand, which are considered to be the main breeding foci of the tsetse fly, (*b*) the isolation, by means of similar barriers, of other breeding places of tsetse fly which occur outside the game reserves, and (*c*) discriminative thicket clearing with a view to rendering a number of suspected breeding places unsuitable for fly breeding. A rough estimate of the areas to be cleared of bush in the so-called barrier-clearing is 120,000 acres.

Bush clearing on an extensive scale has been undertaken by the Division of Veterinary Services on Crown land and by the Department of Native Affairs in native reserves. The understanding now reached is that all labour previously employed by the Division of Veterinary Services will be taken over by this Division and, similarly, that all bush clearing in native reserves will be taken over by this Division as soon as the necessary organization can be established. All labour of the Division of Veterinary Services was taken over by this Division from 1 August of this year.

In view of the difficulty and delay in obtaining equipment, this Division has not yet been able to take over bush clearing in native reserves, but expects to be able to do so shortly when bush-clearing equipment on order comes to hand and the best and most economical method of operation has been determined. It is hoped to have the technique established within the next two months, when this Division will assume responsibility for all bush clearing in Zululand.

The intention is to mechanize bush clearing as much as possible with the object of expediting the work and doing it more economically. The greatest difficulty has been experienced in obtaining the necessary machinery. It has been ascertained that bulldozers, which would be most valuable for doing rapid clearing of thicket in flat country, will not be available for at least another 18 months. The Division has been successful in acquiring five portable air compressors, and these machines have proved most useful in digging out light trees and bush at the Drakensberg Conservation Area, where they have been extensively used. They have not so far proved capable of dealing with large trees in Zululand, but appear to be able to deal effectively with thickets. Hand operated Australian monkey winches (stump-pullers) have been ordered and will be able to deal with large trees.

Recently an agreement was entered into with a private firm to put their tractor-operated stump-pullers on trial for a period of

two months. The trial will demonstrate the value and economy of the machines under conditions existing in Zululand. If the claims of the firm are substantiated, it is possible that the whole policy of bush clearing will be altered and that an agreement will be concluded with the firm to undertake the whole job.

The bush-clearing campaign in Zululand is as yet in its infancy, but should be well under way within the next few months. It is hoped from the experience which will be gained in Zululand to be able to formulate schemes and build up the nucleus of an organization to deal with the highly important problem of bush encroachment in various parts of the Union.

C. Extension Services.

(1) District Extension Work.

The extension officer is a specialist who must be intimately familiar with the area he serves and the farming carried on therein. His main functions are to maintain close contact with the farmers of this area, to co-operate with them in the development of farming systems and practices that are suited to the local conditions and to furnish them with all the necessary technical advice in this connection. Broadly speaking, his aim is to promote both increased production and greater stability of production from farming in his area, with due regard to all the necessary measures to ensure the proper conservation of soil, veld and water resources.

Besides assisting the farmer to obtain and make practical use of the results of research and experimentation, he brings to the notice of the rest of the Department, including the research workers, the problems and the needs of the farmer. He therefore constitutes the indispensable link between the farmer and the Department. With his scientific background and his close contact with practical farming, he develops a thoroughly practical, but none the less scientific, outlook on the problems of farming, which wins him the confidence of the farmers in his area and enables him to persuade them to put into practice the advice of the Department.

Unfortunately the number of extension officers is at present so small, and consequently the area served by any one officer so large, that they are able to devote but little time to real extension work. For, in addition to their extension duties, they are saddled with an enormous amount of regulatory work in connection with bull inspection, seed potato inspection, soil erosion and silo schemes, and the like.

The Department is determined, however, to expand this service to an extent commensurate with its value and scope, which will henceforth include numerous additional duties arising from the coming into operation of the new Soil Conservation Act. The areas served by these officers will have to be reduced to an extent that will enable them to attend to the needs of every farmer in the country. Furthermore, it is intended to provide them with technical assistants to assist them in work of a more or less routine nature, so that they may be able to concentrate more on farm planning and advisory services.

In the year under review there were only 37 extension officers in the field to serve over 100,000 farmers. The following figures of some of their main activities during the past year reflect the extent of the services they were able to render to farmers: personal visits paid to farms, 13,213; different farms visited, 10,696; farmers' meetings attended, 1,230; lectures and demonstrations given, 1,580 (total

attendance 29,733); field demonstrations conducted, 2,504 (total attendance 18,671); animals handled in advisory capacity, 49,705 cattle, 68,765 sheep, 2,741 pigs, 1,313 horses, 18,371 head of poultry; bulls inspected, 12,808; letters written to the public, 11,923; office interviews with visitors, 13,515; farmers' tours organized, 17 (participants 380); shows at which extension officers acted as judges, 30; soil erosion inspections and surveys carried out, 3,333; mileage of contour-banks marked off, 1,497; applications for silos handled, 315, and inspections made in connection therewith, 164; articles written for *Farming in South Africa* and the Press Service, 17.

Although these figures are not unimpressive, they reveal none the less that the extension service, at its present strength, is touching little more than the fringe of the country's farming and soil conservation problems.

Agricultural Clubs.

It is axiomatic that when one has an educational task to perform, the earlier one begins it in the life of the people, the longer period they will have in which to use the education offered and thus the more effective it will be. For this reason the Department has from the outset given youth a significant part in the extension programme. Nearly 34,000 juveniles from 10 to 18 years of age are reached through the agricultural club movement.

The Agricultural Club leader tells how J. Smal, seated in the foreground, produced 35½ bags of maize per acre.

The requirements for membership of these clubs is that each boy or girl enrolled must undertake a project or demonstration showing the better way in some farm or home enterprise, such as growing maize; gardening; raising pigs, poultry, beef cattle, or dairy animals; sewing, interior decoration and furnishing; canning and preserving food; or collective land service work.

The clubs hold monthly meetings at which the members discuss the progress of their projects, and also mix socially. They exhibit their products on "achievement" days and at agricultural shows.

All officers of the extension and home economics services are required to promote agricultural extension work through the agency of youth. Owing to the large number of families in each extension

officer's area, it is necessary to enlist the co-operation of competent farm men and women, teachers, ministers and others to guide the agricultural club movement. These lay leaders, often high school college graduates, have been of invaluable assistance. The extension officer gives them a measure of training and the local leaders then extend the information to the respective youth groups.

Objectives.—Club work is helping to develop rural leadership by encouraging rural youth to undertake important work in the way of demonstrations on the farm and in the home and community, to maintain a record of their work, to exhibit and explain it to others and to draw up final reports. It encourages young people to develop and stage plays and pageants, shows and achievement days, establish bands and choruses, and arrange debates, camps, picnics and other social events that add pleasure, culture and interest to rural life.

Club work is also helping to make rural youth conscious of the privileges and the inherent beauties of rural life, as well as of the contribution which it can make to the economic and cultural life of both country and town.

Achievements.—The movement continues to flourish. The war certainly impeded its progress, but even during the war years rapid growth took place, which indicates clearly the wide appeal of the agricultural club idea. Since 1940 the club movement has been publishing its own magazine; at first the title was " Joy In Doing ", but in November 1943 this was changed to " Pro Patria."

During the past year 9,309 club members devoted no fewer than 3,000,000 hours to club work on their own plots and farms, or on other farms. At fourpence per hour this represents labour to the value of £50,000, equivalent to the work of 4,654 ordinary farm labourers. The value of their produce amounted to approximately £200,000. The average production of maize by 500 members over the past few years is about 11 bags per acre, as compared with a mean yield of 3·7 bags per acre for the Union and 5·3 bags per acre for the high veld of the Transvaal, the best area, these figures being taken from the latest report of the Agro-Economic Survey.

Four provincial club camps were held during the year for the instruction, entertainment and recreation of club members. Camps were also held for the purpose of land service—combating soil erosion, assisting farmers with the reaping of their crops, and the like. By these efforts club members have kept well abreast of modern farming developments and new ideas.

There is no better way for young people to begin their study of the art and science of farming than to become members of agricultural clubs. This is the only youth organization concerned primarily with the land.

Even if farming is not to be the chosen calling of the club member, the boy or girl will at least have learned something about the conduct, management and control of affairs in the farming world, and the knowledge and experience gained will unquestionably prove most useful in later life. The movement provides an interesting, realistic and profitable means of education in agriculture, without the necessity of taking a course at an agricultural college.

During the year under review the officers detailed for club work paid 1,021 visits to clubs and farms, conducted 1,892 inspections

at places where the projects were carried out, attended 420 meetings, arranged 10 cinema shows, and gave 201 lectures and demonstrations which were attended by 32,234 persons (children, parents and teachers). A total of 6,862 boys and girls from 215 different schools participated in individual and other projects as follows: vegetables, 1,920; flowers, 65; wheat, 17; potatoes, 47; maize, 520; fruit, 27; poultry, 210; calves, 94; sheep 41; pigs, 37; ox-fattening, 10; homing pigeons, 130; bird protection, 47; judging cattle, 48; judging sheep, 42; judging poultry, 65; judging pigs, 41; buttermaking, 30; woolwork, 101; sheepskin work, (girls) 15; sheepskin drying, 185; tanning, 27; needlework, 820; preserving, 160; baking, 200; woodwork, 94; health, 280; home, 401; dramatic performance, 141; arts, 103; public speaking, 24; club meetings, 12; soil erosion, 28; tree-planting, 320; eradication of weeds, 430; while 8,072 took part in group projects such as land service, collecting bones, beautifying school grounds, combating soil erosion, etc. In addition, 20 teams were trained for judging and 54 for demonstration purposes; 26 achievement days were held and successful camps, attended by 1,207 members and leaders, were held at Lydenburg, Lichtenburg, Pretoria, Vaal-Hartz, Frankfort, Heilbron, Stellenbosch and Rooigrond. Special club shows were again held at Lydenburg, Bothaville and Johannesburg.

Land Service.

As a result of the outstanding success of the agricultural club movement among children, a national land service movement for adolescents (over 18 years of age) came to be established and already promises to grow into one of the most important and beneficient movements for promoting the general welfare of the country.

Unfortunately, no full-time officer, who could give continuous attention to this work, was available during the past year. Nevertheless, interest in the movement has been growing steadily and several successful land service camps have been held in all the Provinces. These were well attended and valuable work was done in the way of combating soil erosion, planting trees, building reservoirs, assisting farmers with the harvesting of crops, and so forth. This movement was launched during the war, but will have an opportunity of proving its importance and national value in the near future.

Co-operative Demonstrations.

During the past year extension officers again devoted considerable attention to co-operative demonstrations on private farms as an important part of their propaganda for better farming. These demonstrations, based on the principle that " seeing is believing ", are proving outstandingly successful, mainly because the results are obtained on ordinary farms rather than on experiment stations.

But apart from the propaganda value of co-operative demonstrations, the information gained therefrom is proving extremely helpful to the Department. A particular crop or farming practice which has proved itself under the environment of a particular experiment station can, through the medium of co-operative demonstrations, be tried out in other areas. Even negative results in this respect are of value, as they prevent wrong advice and propaganda from being disseminated.

During 1945-46 approximately 400 co-operative demonstrations were conducted by extension officers in various parts of the Union and very useful information was obtained. The reports submitted by extension officers indicate that attention was again focussed mainly on stimulating the production of fodder crops in rotation with cash crops.

Where possible, the crops should be either legumes or perennials, in order to improve the nitrogenous content and the structure of the soil. Insufficient supplies of high quality reserve feeds for stock and unsufficient attention to suitable systems of rotation for maintaining the fertility of cultivated lands, are considered to be two of the main weak links in our systems of farming. It is for this reason that co-operative demonstrations are focused mainly on these two aspects.

The reports indicate that good results were obtained with vetches, dryland lucerne, setaria grass, Rhodes grass, clovers and the improved varieties of teff. Vetches, mainly hairy types, have again done well in the south-eastern Orange Free State, north-eastern Cape Province, eastern Transvaal and parts of Natal. This crop is proving to be particularly well suited to the two first-mentioned areas, owing to the shortness of the summer season and the slightly higher rainfall during the six winter months as compared with the recognized summer-rainfall cropping areas. If planted early in autumn, hairy vetches will provide good grazing in winter and spring, and will in addition yield a good crop of hay with the aid of spring rains. Attempts at seed production have been fairly successful, especially under irrigation in the Lydenburg area, and it is hoped that very soon sufficient seed of this valuable crop will be produced in the Union to meet the growing demand.

Mainly as the result of the stimulus provided by the existing Government subsidy, an increase in the area under dryland lucerne is reported and good results have been obtained.

Co-operative demonstrations with Setaria grass in various areas of high rainfall have proved very successful. This grass yields a large quantity of highly nutritious feed and is becoming popular. Being a perennial, it is a useful crop in rotation with annuals.

In co-operation with the Agricultural Research Institute, Pretoria, which kindly supplied the seed, a number of co-operative demonstrations were again laid down in the eastern Transvaal highveld with the improved strains of teff that were bred by that institution. The results again proved that some of the strains are eminently suited to the highveld, the yields obtained being in some cases three times as great as those obtained from the commercial variety. Good progress has been made with seed production.

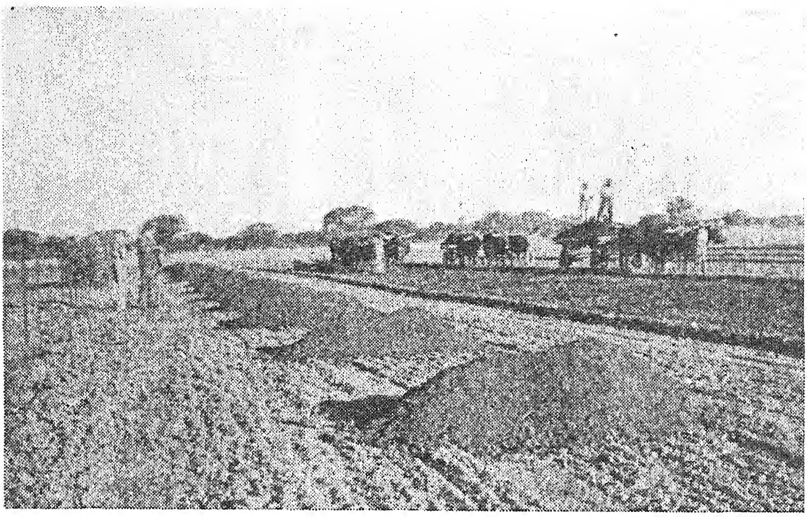
Whole-Farm Demonstrations or Demonstration Farms.

From a small beginning during the 1942-43 season, when 6 farms were selected and started as whole-farm demonstrations, this method of publicity for better farming systems and conservation farming has now been extended to 20 different areas. Of the 14 new farms, 7 completed their first season, while 7 were started during the year under review and will be in full swing in the coming season.

Whereas in the case of the ordinary co-operative demonstration only one or a few aspects of better farming are demonstrated, in the case of whole-farm demonstrations the whole farm is taken over for the purpose of demonstrating a suitable system of farming for the area in which the farm lies—naturally with the consent and full co-operation of the owner. The farm is carefully chosen in respect of size and various other factors. A committee consisting of the farmer co-operator, the local extension officer and as many other Departmental officials as are required for the various branches of farming represented on the farm, decides on the system of farming to be followed and works out all details on the farm management programme. This the co-operator must undertake to adhere to for at least a period of some years; as a *quid pro quo*, the Division

assists him by meeting such additional or "unusual" expenditure as may be called for under the new farming plan.

The results obtained with whole-farm demonstrations have been very promising indeed. They have proved conclusively that *conservation farming pays.* Six farms, which have now completed their fourth season, have again given much higher yields and at the same time more stable returns to the farmers concerned than ever before. In addition, improvement in the quality and cover of the veld and in the fertility of the lands is clearly noticeable. Many of the farms



Waste not, want not. — Turn waste material into compost.

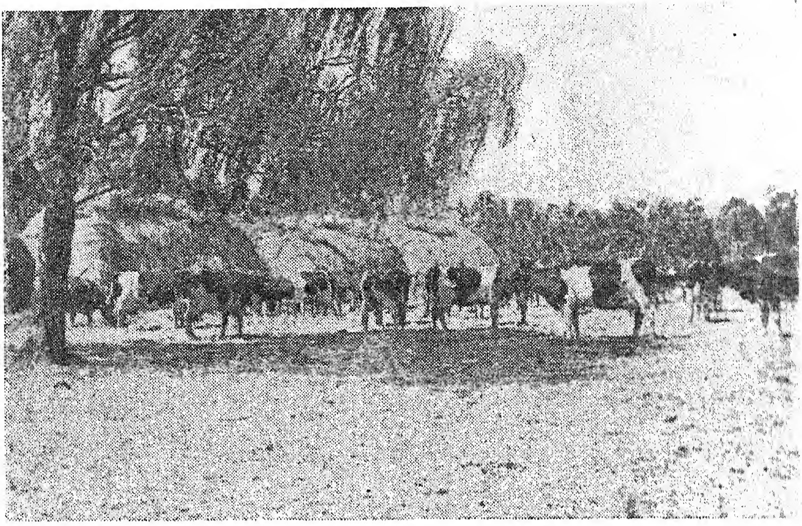
were, apart from other reasons, chosen because they were on the decline as far as fertility was concerned. Any improvement in this respect must therefore be attributed to the improved system of farming and the improved methods of land use that are being followed.

From the experience so far gained it is clear that the two main essentials of a sound system of conservation farming, namely, the ensuring of a satisfactory financial return and the improvement of the fertility and productivity of the soil and veld, can readily be attained. The main factors taken into consideration when determining the most suitable system of farming to be followed are, naturally, the ecological conditions pertaining on the particular farm or, in other words, "farming with and not against Nature". Notwithstanding this fact, however, experience has taught that the systems are flexible enough to permit of some variation in order to fit the system into the economy of the country. An example is the interchangeability of poultry and pigs in many cases. This flexibility also makes is possible to allow the farmer to follow his own preference in certain instances; for example, as regards particular breeds of livestock to be kept.

As the name indicates, these whole-farm demonstrations, perhaps more appropriately termed "demonstration farms", aim at demonstrating under actual farming conditions the most suitable systems of farming for the areas concerned, as well as sound methods and

practices of land use within the approved systems. Their success must therefore be judged in the first instance by the influence they exercise on farming in the surrounding areas. Although the development of demonstration farms is still in its infancy, it is already clear that they are proving a great stimulus for better farming.

In the course of last year short articles on the objects and results of some of the demonstration farms were published in *Farming in South Africa*, and the agricultural and daily press also gave some publicity to the results obtained. Furthermore, very successful farmers' days were held at two of the demonstration farms and were attended by approximately 700 farmers in all.



The dairy cow fits into the farming system on the highveld.

The effect of this publicity has been remarkable. The Division as such, and particularly the extension officers in the field, have lately received a flood of requests from farmers either to plan suitable systems of farming for their farms, or to make use of the latter for demonstration purposes. This keen interest shown by farmers in improved systems and practices of farming is very encouraging. Since whole-farm demonstrations appear to be a highly effective medium for passing on information at the disposal of the Department in a practical manner to farmers, it is the intention of the Division to extend the system as rapidly as the staff position allows.

A special word of appreciation is due to the co-operators who are conducting whole-farm demonstrations on their farms. They are rendering invaluable, unselfish service not only to the Department, but to the whole farming community of the Union. The Division also wishes to acknowledge the invaluable assistance rendered by other divisions and departments, notably by the Department of Forestry, the Division of Agricultural Education and Research and the Division of Chemical Services.

Film Services.

The cinema has established itself securely as one of the most popular forms of entertainment and it is also rapidly developing into a highly important medium of instruction and education.

Many years ago, in the early days of the extension service in South Africa, good use was made of the films which were then available. Cumbersome apparatus had to be transported by train from Pretoria to the towns where extension officers were stationed. From there these officers had to travel by car, over rough roads, to the most remote parts of the country—to show films where the cinema was almost unknown. Nevertheless, these films were enthusiastically received and certainly helped enormously to spread knowledge of better farming methods. The depression hampered the further development of these pioneer film services. At the time of the Empire Exhibition and prior to World War II a few more South African agricultural films were produced, but the progress made left much to be desired, due mainly to lack of the necessary equipment, staff and suitable up-to-date films to expand this service.

The former Division of Soil and Veld Conservation made excellent use of films in an effort to waken the country to the dangers of soil erosion. An officer of that Division was deputed to make films for this purpose and to show them to rural and urban audiences throughout South Africa. This he did with outstanding success: his original film "South Africa in Danger" became known throughout the length and breadth of the country and was always in great demand.

Since the formation of the new Division of Soil Conservation and Extension, steps have been taken to improve and expand this important branch of the service. It is planned to have in each of the five regions established under this Division one cine van fitted with the most modern cine equipment procurable. Staff will be trained in the art of cine-projection and photography. It is felt that the time is now ripe for the production of films which give positive advice and guidance on conservation farming, and every effort is to be made to have good sound films produced in colour for this purpose.

Radio.

The radio, a relatively new device in the field of agricultural education, has increased greatly in importance as an extension medium since the war. Restrictions on travel and increased demands on the time of both extension personnel and farmers have also been influential in bringing about the change. This has been the case all over the world.

The radio has been used in South Africa for some time to disseminate advice on farming and domestic science. Until April 1946, short programmes were put on the air three times a week. With the co-operation of the South African Broadcasting Corporation, the programmes have been lengthened and are now broadcast at a more suitable time. Instead of the ordinary "straight" talks, the programmes now include interviews, forums, discussions and actualities. To obtain the necessary material for these programmes, the organizer of the radio services of this Division accompanied members of the Broadcasting Corporation on an extended tour in a mobile recording van. On this tour of over 2,000 miles, recordings were made at the Vlekpoort and Drakensberg Conservation Areas, the agricultural colleges at Glen, Grootfontein, Cedara and Potchefstroom, on various farms, as also at the Döhne Experiment Station and on sugar plantations in Natal.

The present service is to be further improved in the near future, when 20-minute programmes will be on the air on Mondays and Wednesdays, at 8 p.m. It is the intention to make the fullest use of all sources of information. The Division desires the co-operation of all those interested in better farming and soil conservation. The

programmes will most certainly not be limited to the voice of the Government expert—the voice of the farmer, of the manufacturer, or of the consumer, will be heard in future programmes.

The type of programme which covers an informal discussion by a team of four or five men, representing various trades, interests or ideas, all having a real interest in the subject under discussion, has proved most satisfactory and popular. Listeners prefer listening to an interview rather than to a straight talk, and actualily or outside broadcasts help to stimulate local interest and enhance the value of the programme.

With the help and co-operation of the South African Broadcasting Corporation, future programmes should be interesting and entertaining enough to ensure that agriculturists in all parts of the Union, not to mention townspeople, will listen in regularly, and it is hoped they will find the programmes instructive in regard to the vital issues of increasing the country's agricultural output and conserving our natural resources.

(2) Animal Husbandry.

It goes without saying that extension officers have to develop a broad and balanced outlook on farming in their areas which enables them to advise farmers not only in regard to correct systems of farming, but also as regards the relative emphasis to be placed on any particular branch. Soil conservation is primarily a matter of correct and balanced farming; very often the significance of the part played by livestock in a farming system is not sufficiently understood by the farmer, and this again is not conducive to correct land use.

The officers mentioned are called upon to devote a considerable proportion of their time to advice on the breeding, feeding and management of all classes of livestock. It is interesting to note that 80 per cent. of all the co-operative demonstrations so far conducted have been in connection with the provision of feed for livestock; this is due to general realization of the fact that improved breeding cannot attain the object aimed at unless accompanied by better feeding.

An aspect consistently stressed by extension officers in regard to the improvement of output, is the need for improved autumn feeding conditions in order to lengthen the period of peak summer production of milk, wool, meat and the like. Many of the demonstrations carried out have shown that it is possible to maintain and prolong the summer peak production in a practical way.

Cattle.

As regards cattle, the average production of milk per cow and of beef per steer is still deplorably low in South Africa. There is room for great improvement in these respects. In any farming venture in which cattle play a part, the correct balance between soil, feed (including veld) and livestock must be maintained. Cattle improvement must go hand in hand with soil conservation, correct veld management and better feeding.

The Livestock and Meat Industries Act of 1934 had as its obvious purpose the improvement of cattle, especially by breeding. The duties of bull inspection are carried out by officers of this Division. It is a pleasing fact that the general quality of bulls offered during the year under review showed an improvement on that of pre-war years. In 1938 about 50 per cent. of the bulls offered for inspection

were rejected, and inspectors passed more than three times as many grade bulls as registered bulls. The figures for the past year are:—

Bulls Passed.		Bulls Rejected.	
Registered.	*Grade.*	*Registered.*	*Grade.*
3,448	5,485	375	6,028

From these figures it is evident that fewer poor quality bulls are now offered for inspection and that the ratio of registered to grade bulls passed has greatly increased in favour of registered animals. In due course the minimum standard required for passing a bull will probably have to be raised, for there have been complaints by stud breeders that the standard is still much too low.

During the past year this Act was amended and certain improvements introduced. At present there are 172 districts proclaimed as Cattle Improvement Areas Of these, 84 are in the Cape Province, 36 in the Transvaal, 35 in the Orange Free State and 17 in Natal.

If it is borne in mind that there were on an average only 30 extension officers in charge of bull inspection over the whole of the Union, i.e. about five and two-thirds proclaimed districts per inspector, and that bull inspection is only one of very many duties which extension officers have to perform, then the difficulties under which these officers work is apparent. Farmers who become extremely annoyed because their bulls are not inspected speedily enough, might bear these facts in mind.

Pig Production.

There has been a steady improvement in the type and quality of pigs bred in South Africa. The baconer types are most popular and relatively pure-bred boars are being used to an increasing extent for pure breeding or cross-breeding. Unfortunately the development and improvement of the pig industry have been hampered by the shortage of maize and certain protein feeds.

Horses.

The revival of interests in equine production during the last decade has been fully maintained during the war period. The increasing use of utility types was further stimulated by the uncertain supplies of mechanized power and fuel.

Prices for utility animals reached unprecedented levels and even now the demand far exceeds supplies. Numerous stud animals of the utility breeds have been imported since shipping facilities became available, but tens of thousands of mules and horses were exported during the war.

The Government is keeping step with this renewed interest and has strengthened its studs by fresh importations, while the horse improvement scheme is giving good results. Extension officers throughout the Union are aware of the intensified use of equines and have assisted farmers with advice and guidance in this respect. Shortage of suitable equipment and implements, however, is restricting a wider use of good equines; but interest is growing, so much so, that an embargo has been placed on the export of certain utility types that are in short supply.

Indigenous Breeding Material.

It is felt in many quarters that insufficient attention has been paid in the past to the country's indigenous breeding material. In this connection a suggestion emanating from one of the extension officers has resulted in the formation of an inter-departmental committee to investigate and make recommendations on the protection and development of such indigenous breeding material, notably indigenous "breeds" of cattle, goats, sheep and horses.

(3) Field Husbandry.

Maize Propaganda Campaign.

As a result of extremely unfavourable climatic conditions, as well as a shortage of fertilizers and other factors arising directly or indirectly from the war situation, the Union's maize-crop during the past few years has fallen considerably short of the requirements of the country. A stage was reached where it became necessary to cut the maize rations for animal as well as human consumption, and the prospects for the future seemed anything but promising. In an attempt to improve this situation, it was decided in August 1945 to start an intensive maize-growing propaganda campaign in the maize-producing areas, and this Division was delegated to carry out the campaign.

All extension officers in the areas concerned, totalling 29 districts, were given instructions to devote all their time to this work, and seven additional officers were temporarily seconded from other areas for the same purpose. The Controller of Fertilizers co-operated whole-heartedly in this campaign and made available some 20,000 tons of fertilizer, which was divided amongst the districts concerned. Intensive propaganda was made in the press, on the radio and at numerous meetings called by the field officers. These officers deserve much credit for their success in a big task where time was the determining factor. Within about two months they addressed 68 meetings, which were attended by 4,263 farmers; and they visited 1,532 farms and advised 5,540 farmers individually on the production of maize. Allocations of fertilizer were made to individual farmers by fertilizer committees established in each district. Co-operative societies throughout the area very kindly consented to handle the orders for fertilizer and a short time after orders were placed farmers were beginning to receive their quotas.

Matters began to grow serious, however, when it appeared that all these efforts were likely to be in vain, because the expected spring and summer rains did not materialize and the country found itself in the grip of one of the worst droughts ever experienced. The already over-burdened veld remained almost lifeless, draught animals lost condition, and in many districts the lands remained so hard that farmers found it impossible to plough. With the danger of a serious food shortage looming ahead, the Government then decided as an emergency measure to make tractors available for ploughing purposes in the drought-stricken areas, as described in the following section.

Tractor Scheme.

The Division was placed in charge of this scheme also, which was applied in the eastern Cape Province, the Natal midlands and the major portion of the Transvaal. The Department had only a limited numbed of tractors available, but with the assistance of the provincial administrations of Natal and Transvaal, it was possible to put some 90 tractors in the field.

The extension officers serving the areas indicated, had to manage the scheme in the field. They were, however, ably assisted by the district committees, already referred to, over which the local magistrates presided. Applications from farmers for assistance in connection with ploughing, planting, discing and harrowing were considered by these committees, and the allocation of tractors was based on the number of applications received from the different areas.

The scheme was received very favourably by the farming community, but, due to the limited number of tractors that could be made available, only a small percentage of what most applicants

required in the way of ploughing, planting, discing or harrowing, could be granted. In some districts the work was retarded by the continuation of the drought and in many instances tractors had to follow up small showers of rain in order to remain usefully occupied. The season was well advanced when the first good general rains came (in January) and these helped to speed up the work.

In view of the threatened food shortage, and in the hope that the frost, in this most extraordinary season, would be delayed, the work of ploughing and planting was carried on until well into March. In Natal, where the drought was at its worst, some 2,650 morgen were ploughed and 135 morgen disced. In the Transvaal, some 5,500 morgen were ploughed, 2,700 morgen disced, 1,138 morgen planted and 230 morgen harrowed. Figures for the eastern Cape Province are not available. In the Orange Free State a separate ploughing scheme was carried out by the Provincial Administration.

Since it was evident that a total crop failure would bring a calamitous food shortage in its wake, all officers concerned with the scheme carried out their various tasks to the outmost of their ability. Fortunately, the frost came very late, and not only was a reasonably good potato crop harvested, but the estimated maize crop of over 18,000,000 bags, in perhaps the worst season this country has ever experienced, reflects well on the efforts of both the farmers and the officials concerned.

Seed Potato Scheme.

In 1941 there were only three seed potato growers' associations, which produced approximately 3,000 bags of certified seed per annum. To-day there are 48 associations organized into 8 regional federations, with a central co-ordinating organization. These associations produced 75,000 bags of A and B certified seed potatoes during the past season.

The important duties of inspection of the crops on the lands and of the seed for certification have been carried out by the extension officers of this Division in collaboration with agronomists of the Division of Agricultural Education and Research.

(4) Home Economics.

The extension services rendered by this section of the Division afford a valuable medium by means of which rural and urban communities can be reached, either collectively or in individual homes, and enlightened on various aspects of home economics.

In spite of the difficult times, organizations of housewives have continued to show a keen interest in these services, which cover an extremely wide range. During the year under review, numerous lectures and demonstrations were given on various home economics subjects including food selection and preparation; preserving of fruits and vegetables; clothing construction, renovation and pattern-making; interior decoration and furnishing; millinery; and general household management. Special attention was given to current food shortages, the provision of suitable substitutes, and the better and more economical utilization of food generally. Radio talks on this subject are broadcast weekly and are proving to be most popular.

Officers of this section visited 524 different centres, giving 572 demonstrations and lectures, and held 10 short courses, the combined attendance amounting to a total of 16,069 people. In addition, they judged at 40 shows; acted as adjudicators in 143 special competitions; visited 49 schools for the purpose of starting girls' clubs; lectured at 18 farmers' days; attended 4 Women's Agricultural Union congresses and 24 other Agricultural Union conferences; wrote 6,017

Safeguarding the Union's Livestock Industry.

P. J. du Toit, B.A., Dr. Phil., Dr. Med. Vet., D.Sc., Director, Division of Veterinary Services.

A.—Research at Onderstepoort.

Issue of Laboratory Products.

THE following table shows the number of doses of vaccines and other laboratory products issued during the year ended 30 June 1946, as well as the number of tests carried out and smears examined. Comparative totals for two successive years are given. In practically all cases there has been a drop in issues of the various products, which to a great extent is accounted for by the severe drought experienced during the year under consideration. The considerable decline in the issue of horse-sickness vaccine is also accounted for by the fact that less vaccine was issued to the Middle East than during the previous year. The annual block inoculation against anthrax in the Transkei was not carried out during the period under review and this accounts for the considerable decrease in the issue of this vaccine.

	1/7/44 to 30/6/45.	1/7/45 to 30/6/46.	Increase.	Decrease.
Black quarter	1,383,315	1,182,855		200,460
Blue-tongue	2,303,736	1,649,892		653,844
Anthrax	5,948,980	5,144,690		804,290
Contagious abortion	79,988	88,942	8,954	
Gallsickness	181,506	76,135		105,371
Tuberculin	33,864	39,214	5,350	
Mallein	4,269	5,175	906	
Paratyphoid	324,260	253,119		71,141
Fowl typhoid	559,385	506,412		52,973
Horse-sickness	369,190	202,841		166,349
Fowl-pox	797,950	1,004,950	207,000	
Nodular Worm Remedy	19,490,100	15,388,200		4,101,900
Tetram (gal.)	5,200	2,922		2,278
Bloedpens	128,820	135,835	7,015	
Blow-fly (gal.)	45,089	39,901		5,188
CCl_4 (gal.)	3,765	615		3,149
Lamsiekte	—	157,255		
Serum Tests.				
C.A. Tests	19,637	13,593		6,044
Dourine	5,089	5,213	124	
Smears.				
Onderstepoort	98,441	104,119	5,678	
Pietermaritzburg	54,297	55,298	1,001	
Grahamstown	4,112	8,672	4,660	
Umtata	182,000	224,085	42,085	
East London	59,793	98,564	38,771	
Natal	340,360	343,621	3,261	
Kokstad	—	34,393	—	

Protozoal Diseases.

Nagana.

During the year under review the nagana position in Zululand deteriorated markedly as a result of the spread of *Glossina pallidipes* through the low-lying and heavily bushed country throughout the

potential fly area. This was mainly due to favourable climatic conditions for the fly, the uprecedented breeding which took place and the increase of the bush thickets favouring the dispersion of the fly along the bush leaders and rivers. The disease spread to extreme limits in all adjoining native reserves, on to the Ntambanana, Nkwaleni, Entonjaneni, Hluhluwe and Mkuzi settlements and on to the Magut area in the Ngotshe district, affecting all the farms north of the Nongoma-Magut road, extending across the Pongola river into Swaziland. The total area affected is approximately 4,000 square miles. The mortality amongst cattle from trypanosomiases was high and heavy losses were suffered by all cattle owners in the areas involved.

All control measures against the tsetse fly were intensified during the year, in close co-operation with the Department of Native Affairs. These consisted of game eradication, bush clearing, controlled burning, D.D.T. applications and trapping.

The game eradication campaign in the Umfolozi Game Reserve and adjoining Crown lands was well organized. The eradication of game in the native reserves is under the direct control of the Department of Native Affairs.

Bush clearing consisted mainly of barrier and thicket clearings. In the Mkuzi and Umfolozi Game Reserves the thicket clearings are directed against the breeding areas of *G. pallidipes*. The thicket clearings in the Mkuzi Game Reserve were suspended when D.D.T.-spraying by aircraft was commenced in November 1945. In the Umfolozi Game Reserve approximately 2,500 acres of thickets were cleared. Barrier clearings, 24 miles long and ¾ mile wide, have been completed along selected watersheds in the Crown lands south and west of the Umfolozi Game Reserve in an attempt to stop the southward spread of the fly, and so protect the Ntambanana Settlement and native reserves. In the Hluhluwe Game Reserve a barrier clearing 4 miles long and ½ mile wide has been completed along the eastern boundary of the game reserve across the Hluhluwe river. All clearings were done by native labour, but arrangements were made for the Division of Soil and Veld Conservation to take over all bush-clearing operations. These clearings are to be increased to a width of 1½ to 2 miles, especially across bush leaders and rivers. All bush clearings in the native reserves were undertaken by the Department of Native Affairs.

When trapping started in the Umfolozi Game Reserve in 1931, burning of grass was discontinued to preserve the traps. This resulted in a marked encroachment of bush and heavy thickets. During the past three years annual grass fires were organized in the late dry season to burn out the bush thickets. The results are very encouraging and extensive bushed areas have been opened up where the grass is again establishing itself.

D.D.T. is a very useful weapon against *G. pallidipes* which is most susceptible to the lethal effects of the preparation and it therefore only remains for correct methods of application to be evolved. The first application of D.D.T. in a furnace oil solution by aircraft gave promising results but was not entirely satisfactory. In the meantime observations are being continued in an attempt to determine the most effective way of applying the insecticide.

Trapping with the Harris trap revealed that although it was the best mechanical means of recording the presence of *G. pallidipes*, it can no longer be considered an effective control measure for the eradication of this species. The Harris trap will, however, still be used for extensive surveys within the potential fly areas and will

also be used to indicate the seasonal variations of fly densities within the high fly-density areas in the game reserves.

In addition to the above control measures, the gazetted cattle-free areas were also maintained. This was necessary to prevent cattle providing the food supply to hungry flies in the areas in which game were being eradicated and also in adjoining areas. Steps are also to be taken to prevent the white rhino from wandering out of their sanctuary in the western portion of the Umfolozi Game Reserve into native reserves and the Ntambanana Settlement.

Anaplasmosis.

As the result of the outbreak of lumpy skin disease amongst the cattle of Onderstepoort during April 1945, the issue of gallsickness vaccine was temporarily suspended. Since no further cases developed after the beginning of July 1945, tests were undertaken to determine whether recovered animals remained reservoirs of the virus for any length of time. Vaccine was therefore re-issued from the middle of October 1945, but during March 1946 a fresh outbreak occurred and the issue of gallsickness vaccine was stopped immediately.

At present gallsickness vaccine is being issued from the Veterinary Research Laboratory, Pietermaritzburg, only. Unfortunately the stabling accommodation is very limited at that station, so that only a small number of reservoirs can be maintained there for the production of gallsickness vaccine. The demand for the vaccine is very great and consequently only a comparatively small number of doses of vaccine can be supplied to farmers. The epizootology and other aspects of lumpy skin disease are not fully known and it is therefore impossible to state when the vaccine will again be issued from Onderstepoort.

Virus Diseases.

Horse-sickness.—The vaccine contained the same strains of virus as in the previous three years. The number of doses issued showed a decrease over the previous year due mainly to the smaller demand from the Middle East. A total of 202,841 doses was issued as follows: South Africa, 94,101; Military (South Africa), 4,693; Syria, 250; Palestine, 28,150; Egypt, 59,100; Belgian Congo, 147; Transjordan, 4,900; Middle East Forces, 10,000; and French Liaison, Cairo, 1,500.

Work on the attenuation and antigenic analysis of additional strains of virus continued. As a result the vaccine to be issued for the 1946-47 season has been modified by the substitution of two new strains to give a wider polyvalent immunity.

Further investigations into the propagation of virus strains in fertile hens' eggs were carried out and a comprehensive survey of the value of the guinea pig in identifying different strains of virus is nearing completion.

Blue-tongue.—A wide variety of problems connected with the propagation of virus strains in fertile hens' eegs were investigated with the main object of replacing the present vaccine with a safer and more efficient vaccine. About 40,000 doses of bivalent vaccine produced entirely from eggs were issued for field purposes on an experimental basis. Good results were obtained and it has been shown that the whole of the vaccine requirements can be produced entirely from eggs if accommodation, equipment and the necessary staff be made available. Meanwhile a method has been worked out for producing a polyvalent vaccine from sheep, using egg attenuated strains for the

purpose. This vaccine will go into general production for the 1946-47 season.

Further progress was made with the identification of strains of virus from different parts of the Union and altogether 21 strains have now been isolated.

Of the old vaccine 1,609,892 doses were issued, a considerable decrease on the number issued during the previous two years.

Lumpy Skin Disease.—It has been shown that the blood is infective before the typical skin lesions make their appearance. The vector has not been identified, nor has it been possible to commence any research into the development of any method of immunization. The results of a small preliminary investigation into the degree and duration of immunity have indicated that after 12 months the immunity, in some cases at least, may not be complete.

Heartwater.—Further examination has shown that although different strains of virus differ markedly as regards virulence, all appear to have the same antigenic structure. Immunization of adult cattle has been extended and confirms the opinion that the method is practical, but its extension to general use continues to be dependent upon the discovery of some method of cultivation. Work on chemotherapy with various sulphonamides has continued with promising results.

Rabies.—Only diagnostic work was carried out, and of the 62 cases examined, 11 reacted positively, whilst in 5 cases no diagnosis could be made.

The difficulty of diagnosing rabies in dogs in South Africa purely by histological methods must again be stressed.

Fowl-pox Vaccine.—The old method of producing this vaccine from pigeons has been abandoned and replaced by an egg culture vaccine, using the American fowl strain and also a pigeon strain. All the vaccine will now be made at Onderstepoort.

Physical and Physico-chemical Work.—Some progress was made with this work which, however, has had to be curtailed on account of the absence on study leave in America of the officer conducting the work. The chief work carried out was in connection with the production of lamsiekte vaccine.

Bacteriology.

Anthrax.—The vaccine made from avirulent strains of the organism continues to give good results under field conditions. Experiments are in progress to ascertain whether the medium for the cultivation of the organism can be improved to produce a more efficient hyperimmune serum.

Blackquarter.—Attempts are being made to decrease the dose and at the same time maintain the efficacy of the vaccine.

Bloedpens.—There was a slight decline in the demand for the vaccine, but this is to be expected as in most flocks immunization has been carried on for some years and only a single annual dose is given instead of the two given the first year.

Contagious Abortion.—Inoculation against this disease is being undertaken on an ever-increasing scale. It is realized that, except under special circumstances, the isolation policy is unsatisfactory as a means of dealing with the disease. Although calfhood vaccination is particularly recommended, a large number of heifers and cows are being inoculated. It is difficult to judge the results, but from correspondence with farmers it would appear that they are very satisfactory. Fresh cultures of strain 19 used in the vaccine production are

imported from the United States of America at regular intervals in order to keep the efficacy of the vaccine as high as possible. Experimental work on the improvement of the media for vaccine production is in constant progress.

Tuberculosis.—Although the tuberculin issued at present is still the heat-concentrated product which has given such good results for some years, experimental work is in progress on the production of a purified protein derivative (PPD) tuberculin such as is in use at present in Great Britain. There should be no difficulty in preparing this type of tuberculin for use in a general tuberculosis campaign when this is undertaken. During the past two years a number of cases of tuberculosis in dogs have been diagnosed, mainly in Johannesburg. These are mainly human in type, but one bovine type has been diagnosed. Experiments on the immunization of cattle with the Vole bacillus are being continued, but the results on the whole have been rather disappointing.

Paratyphoid.—A number of fresh strains of different types of paratyphoid organisms have been diagnosed. An outbreak of abortion in mares at a remount camp at Pinetown has been investigated and associated with *Salmonella abortus equi* infection which was also responsible for joint infections in a number of animals.

Lamsiekte.—The production of the vaccine against lamsiekte is being studied very carefully. At present the vaccine is still being produced in a medium made from horse flesh and gives a satisfactory immunity, but the dose is rather large (10 c.c.), and research is being directed towards decreasing the dose, while at the same time increasing the efficacy of the vaccine. With the present method of giving two inoculations with an interval of six weeks, it is felt that in some cases the immunity developed may not be quite high enough to resist large doses of virulent toxin. It may become necessary to give a third inoculation but, if the efficacy can be improved, this can be avoided. The decrease in dose and the addition of alum to the vaccine to cause it to be more slowly absorbed will probably make two or even one dose efficacious.

As a result of information received from the United States of America that corn steeping liquor, a by-product in the commercial production of starch, was a very valuable substance for addition to media for the production of botulinus toxin, it was tried here and found to give a very much better toxin than meat media. At present a biochemist is collaborating with the officer in charge of lamsiekte research in the study of the properties of corn steeping liquor, and valuable results are being obtained. Fortunately this material is easily obtainable from a starch factory at Germiston near Johannesburg. It has not been possible yet to produce all the vaccine required on account of a shortage of large culture flasks, but these should soon be available.

Routine Diagnosis.—A large number of blood samples for the diagnosis of contagious abortion and dourine have been examined. A big variety of specimens for bacteriological diagnosis have been sent in for examination, most of which were examined in the various departments of the section.

Poultry.—The shortage of staff has continued and the numbers of specimens and letters received from farmers have shown no falling off. For these reasons, and also on account of the fact that much time has had to be devoted to the training of veterinary students, the amount of research work conducted has had to be limited severely.

Some progress has, however, been made. For the first time, it has been proved that there is a familial predisposition in fowls to the development of brain cancer. This is of considerable scientific interest, even though the cancers are so rarely seen that they are of no economic importance.

Progress has been maintained in building up a strain of White Leghorns not only comparatively resistant to all forms of cancer, but also highly desirable in all other respects.

During the year a new fowl-pox vaccine was perfected and it is now on sale to the public. Further evidence has been obtained of the widespread incidence of psittacosis in pigeons and the risks to pigeon fanciers should always be remembered.

There has been little, if any, abatement in the spread of Bacillary White Diarrhoea. With the old established and more reputable breeders supporting the B.W.D. test on an ever-increasing scale, the present spread of the infection seems to be due mainly to the large number of small farmers who have within the past few years taken to the breeding of poultry. Until some satisfactory scheme for the registration of poultry breeders can be evolved, little further progress in the control of B.W.D. must be expected. Finally, mention must be made of the complete eradication of Newcastle Disease from Natal, after it had been in existence for about a year. Unfortunately this devastating disease now exists all along the East Coast and has spread right across Central Africa to the Atlantic, so that further outbreaks must be expected.

Allerton Laboratory.

Vaccines.—Details of the number of doses of vaccine and other products issued from this laboratory during the year are included in the figures in the schedule contained earlier in the report.

Smears.—In order to obtain assistants for the examination of smears, the Institution trained 19 smear examiners from the ranks of stock inspectors and assistant stock inspectors. The number of smears examined during the period 1 July 1945 to 30 June 1946 was 55,305, as compared with 56,001 for the previous year.

Serological Tests.

Contagious Abortion.—During the period under review a total of 2,856 tests for contagious abortion was carried out as against 3,742 for the preceding year.

B.W.D. Tests.—A very large number of tests are carried out every year, but the year under review was characterized by an increase in applications from the Cape, especially the western Cape Province. Most of the farmers concerned run flocks of 1,000 to 8,000 birds and from the tests carried out it appears that B.W.D. and/or Fowl Typhoid is generally prevalent in those areas. The present number of holders of the B.W.D.-free certificate is 129 as compared with 101 last year. They are divided up among the various provinces as follows:—

Natal	42
Transvaal	52
Orange Free State	15
Cape	20
Total	129

In addition the following number of flocks of active poultrymen are under test in the various provinces:—

Cape	16
Natal	7
O.F.S.	13
Transvaal	20
Total	56

The tests undertaken this year numbered 323,749 with 4,432 positives, as compared with 260,343 tests and 5,443 positives last year.

Post Mortems.— A large number of poultry post mortems were carried out, viz. 664 compared with 889 in the previous year.

Other post mortems carried out were mainly on pigs and calves and most cases showed paratyphoid and worm infestations.

Visits by farmers.—A total number of 528 farmers visited the Laboratory during the year.

General Laboratory Work.—Smear-control work from the districts of Natal increased greatly during the year and a certain amount of mastitis work was also carried out. A few cows were treated with Penicillin, but it was not possible to draw conclusions. A large number of specimens received from farmers was dealt with, whilst many slides were brought in by farmers for urgent diagnosis. In addition, a number of fowls were tested for export purposes and for entry in the Rhodesian Egg-laying Competition.

Parasitology.

Entomological Research.

(1) An extensive investigation into the sheep blowfly problem was undertaken under field conditions in the Graaff Reinet area during the period June 1945 to May 1946. This comprised studies on the species of blowflies in the area, together with their bionomics, both on the living sheep and in carcases, in correlation with climate. Valuable additional evidence was obtained in respect of the rôle played by the large blue-bottle fly, *Chrysomyia marginalis*.

(2) An investigation into the value of D.D.T. under field conditions for the protection of sheep against blowfly strike was undertaken in the Graaff Reinet and surrounding districts and practical methods of application, together with the question of costs, were studied. The protection afforded averaged three months.

(3) The details for the execution of the tsetse fly eradication campaign in Zululand were elaborated at Onderstepoort and the application from aircraft conducted in the Mkuzi Reserve. This entailed the making and testing of spray solutions and, later, methods for the application of D.D.T. in aerosol or smoke form, both from aircraft and static smoke generators.

(4) Investigations regarding the effectiveness and application of D.D.T. for the control of external parasites of domestic animals were actively pursued throughout the period.

(5) Further investigations into the transmission of horse-sickness and blue-tongue were conducted chiefly in respect of the toxonomy and life histories of the various species of *Culicoides* involved.

(6) The Union tick survey was continued throughout the year together with the life history studies on ticks.

(7) Laboratory studies on the effects of the synthetic insecticides, D.D.T. and hexachlorobenzine, incorporated in dips, upon blue ticks

of the arsenic resistant strain were carried out in collaboration with the chemistry section of Onderstepoort.

(8) A short series of toxicity tests of D.D.T. upon cattle was undertaken at the request of the Division of Entomology. The results indicated that pastures could be treated with D.D.T. at rates calculated to destroy insect pests without fear of producing toxic symptoms in cattle, or in man as a result of consuming milk from such cattle.

(9) Numerous inquiries in respect of the control of external parasites of animals were dealt with in correspondence. A great deal of interest on the part of the farming community was displayed in the new synthetic insecticides.

(10) The usual routine examination of specimens of external parasites submitted was conducted, together with the examination and testing, in a few instances, of proprietary insecticides forwarded with the view to their registration prior to being placed on the market.

Helminthology.

Until the middle of December 1945 all the activities of this section had to be carried out by one professional officer, assisted by a part-time technical assistant with the result that most of the work in the section consisted of routine work. An opportunity occurred, however, to carry out an investigation of a severe outbreak of helminthiasis in sheep in the Garies district of Namaqualand. The trouble was diagnosed as due to severe infections of wireworms, brown stomach worms and bankrupt worms superimposed on an infection of large-mouthed worms. The pathogenesis of this last-mentioned worm is not clear, and material and infected sheep were brought to Onderstepoort, where a study of the morphology of the parasite, its life history and effects on sheep is being carried out.

Investigations on the lungworm of dogs are also being continued, but so far it has not been possible to clear up the life history of this parasite, and all attempts to set up an artificial infection have failed.

Large-scale experiments are being carried out at Onderstepoort with phenothiazine to ascertain its efficacy against wireworm and nodular worms in heavily infested sheep. The effects of tetrachlorethylene treatment, and of good food with no treatment are at the same time being followed on two groups of similarly infected sheep.

Bio-Chemistry.

Progress has been made with the study of the nutritive value of South African feeds. The analyses in connection with the digestion trials with grass species from Rietondale Experimental Farm have been completed. Investigations on the chemical composition, with special reference to the sugar, starch, hemicellulose, cellulose, and lignin contents of certain grass species growing under natural conditions and of the oat plant grown under irrigation during winter at various stages of growth, have been initiated. A study relating to the influence of processing and storage on the biological value of the proteins in balanced stock rations is under way.

The availability for rats of the calcium and phosphorus in "electrophos", a product supplied by a private firm, has been investigated. Results were disappointing in that the availability was found to be on the low side in comparison with that of a well-known product like dicalcium phosphate. The investigation is being extended to include ruminants.

Work on the iron and copper metabolism of sheep has been continued. A daily supplement of 500 mg. copper per sheep had no apparent influence on the general health and appetite of the sheep.

During the latter half of the year under review the full-time services of a chemist have been made available to the Bacteriology section. A medium of alkalinized and filtered corn steeping liquor supplemented with calcium lactate has been developed and found to be very much superior to the meat broth hitherto used for the production of toxin by the type D botulinus organism.

Work on the identification of the active principles in the poisonous algae responsible for water poisining is being continued. Preliminary work on the isolation of the poisonous principles in various plants, including *Urgenia rubella*, *Urgenia burkei*, *Solanum panduraeforme* and *Hertia pallens*, is in hand or has been completed. Some attention is also being devoted to Geeldikkop from the point of view of a possible interaction of the nitrate in the Tribulus plant, reduced in the rumen to nitrous acid, with chlorophyll or its degradation products.

Routine analysis again took up a fair amount of time. These included the analysis of animal feeds, salt and water samples on behalf of the farming community, blood and vegetation samples in connection with Armoedsvlakte experiments, and a variety of other routine determinations, e.g. of copper, iron, and vitamin A in post mortem material and fluorine in water samples.

Nutrition.

The uncertainty of securing feedstuff supplies has been a drawback in the carrying out of basic nutritional research on large animals over long periods. In addition, members of the staff have been occupied in the distribution control of protein-rich feeds and bone meal.

Work is continuing, however, on osteodystrophia fibrosa in equines, on which some progress may be reported. Attention is also being given to the digestibility co-efficients of various indigenous grasses and trees. The determination of the suitability and digestibility of different forms of phosphate will be undertaken. The influence of different rations on the softness of bacon is also receiving attention.

Assistance and advice have been granted to farmers and others. Correspondence with farmers in regard to their feeding problems during the present shortage of essential feeds has increased considerably.

Physiology.

Research Work.

(1) *Digestion of Ruminants.*—Various experiments are still in progress in regard to conditions in the fore-stomachs of sheep and the factors determining the multiplication of bacteria and other organisms in these compartments. Particular emphasis has been laid on the effects of different types of food supplements on the consumption and digestion of poor quality veld hay. Furthermore, attention is being directed to the movements of the fore-stomachs and large colon with the object of elucidating the origin and nature of the so-called "dry gallsickness" and other forms of digestive disturbances in ruminants. Various physiological drugs are being tried out in order to restore normal motility. In a further experiment observations are being made in regard to digestion in worm-infested sheep and the influence of feeding on the degree of parasitism.

A sound-colour film of 1,000 feet (made in collaboration with the Film Bureau, Union Education Department, Pretoria) regarding the nutrition of ruminants from the physiological aspect has been completed in the course of this year. This film has already been

shown on various occasions and has been well received. The production of further films will be undertaken in due course, should conditions permit.

(2) *Bioclimatological work on sheep.*—This long-term experiment extending over more than three years has been practically completed and is to be concluded within the near future. Valuable results of a comparative nature have been obtained from sheep continuously exposed to the sun as against others kept in the shade throughout the same period.

(3) *Sex physiology of sheep. The influence of hormone therapy on ewes during anoestrus.*—Interesting results have been obtained on limited numbers of sheep at Onderstepoort. It would indeed be worthwhile to extend these experiments to large numbers of animals kept under natural veld conditions with accurately controlled nutritional levels. Hormone supplies have also been sent out to veterinarians in the course of the year for testing out especially on cows where sterility is encountered. The results of such tests are to be co-ordinated as soon as the majority of the reports have been received.

Faculty Work.—Lectures in physiology with practical work and demonstrations are being continued to second-year B.V.Sc. students, while classes in practical clinical physiology are arranged for third-year B.V. Sc. students.

Pharmacology and Toxicology.

The head of the section resigned from the service in the course of the year, the result being that very little research work could be carried out.

Up to the end of April this section was responsible for both the mineral and botanical routine specimens sent in for analysis and advice.

(1) Altogether 3,042 routine specimens of entrails of animals, water, suspected poisonous plants, soil, licks etc., were analysed. Apart from the chemical analyses, a large number of biological experiments were carried out in connection with suspected poisonous plants and samples of concentrates.

(2) The poisonous-plant garden was in a very bad state and some time was spent there in order to improve the garden. The identification of the plants was not altogether satisfactory as a number of labels were missing and a large number of plants had died. An attempt is being made to identify all plants, to separate them into different beds and to label them properly. The fences have been improved in order to prevent trespassing. For various reasons a large number of plants had died off and an endeavour is being made to replace these, as well as to add new specimens to the collection.

(3) Experiments are being conducted with the object of determining the possible arsenical content of the bones of sheep after continuous dosing with nodular worm remedy and wire-worm remedy.

(4) As a large number of complaints is received in connection with various concentrates, the possibility of fungus poisoning is being investigated. *Fusarium moniliforme* is the first fungus to receive attention.

Surgery, Gynaecology, Sex-Physiology and Radiology, Etc.

Clinic.

Total number of animals treated	2,615
Total number of radiographs	123
Total number of cases treated by diathesing	13
Total number of cases treated by ultra-violet rays	7

Total number of clinical cases treated	1,173
Total number of inoculations	553
Total number of tests	889
Total number of natives treated in First Aid Clinic	284

Research.

Observation on Roaring and Whistling in Horses.—Observations on the heredity of "roaring" in horses have been continued, and 290 horses have now been examined, of which 140 were the progeny of "roaring" sires. There were 8 "whistlers" in the suspect group and five in the control group. There has been no significant difference in the incidence of recurrent laryngeal paralysis between the two groups. In these observations it has not been possible to keep a careful record of the veterinary history of all the cases prior to examination for their wind, that is, at about the age of 3 years and 9 months. It is, however, apparent that an attack of strangles predisposes a horse to laryngeal paralysis. As yet there is no indication that "roaring" is hereditary. A preliminary report is in course of preparation but, before the observations can be completed, the results of mating "roaring" stallions with mares, the progeny of "roarers", must necessarilly be studied. This will take about 5 years to complete as available mares for this mating are only coming forward now.

Sex Physiology.

(1) Work on the sex-physiology of mares kept under the environment prevailing, under housed conditions, at Onderstepoort has been continued and is now reaching finality. The report will be ready for publication at an early date.

The observations so far recorded indicate that oestrus in the mare may continue throughout the year, but there are indications that mares do not conceive easily during the winter months. The data assembled on this point have not yet been fully analysed.

(2) The work on the sex physiology of cattle maintained under conditions of lack of sunlight, lack of exercise, and dry rations has been completed and the final report is now in the press.

(3) The observations made on cattle, in which delayed breeding was superimposed on the above environment, have also been completed, including work on this microscopic picture of the ductless glands and the genitalia.

(4) The work on the sex physiology of rams, that is, the study of the sperm picture in relation to their fertility, has been written up and is now in the press.

Mastitis.

During the past year the data relating to the secretion of abnormal milk by quarters which were free from pathogenic bacteria, were analysed. The records were obtained from regular monthly analyses of milk from the individual quarters of the mastitis-free herd during the previous five years. The results are given in the accompanying table.

An investigation into the various factors which may be responsible for the high percentage of abnormal samples of milk secreted by healthy cows kept under coverage during farming conditions, was carried out. This revealed that a combination of factors was concerned, the most significant revelation being the marked effect of seasonal influences. Contrary to the findings of workers in Europe

Results of Regular Monthly Analyses of Milk from Individual quarters of Mastitis-free Cows.

Constituents.	Total Number of observations made.	Number of times milk was—		Percentage abnormal.
		Normal.	Abnormal.	
Solids-not-fat	1,476	866	610	41·3
Fat	1,476	1,431	45	3·0
Chloride	1,388	9,533	435	31·3
Lactose	1,256	903	353	28·1
Chloride-Lactose Index	1,255	761	496	39·5
Cells	1,168	837	331	28·3

and America where the quality of milk is at its best during the winter months, there was a significant deterioration in milk quality during the South African winter, the milk being abnormal from May until August.

It was concluded that the low plane of nutrition on which the average dairy cow in South Africa was maintained for the greater part of the year, was mainly responsible for this deterioration. The best quality milk was obtained during spring and early summer (October and November) when the natural vegetation of South African pastures has its highest nutritional value.

In collaboration with the Allerton staff, tests were carried out at Cedara to ascertain the efficacy of the intravenous administration of acriflavine in the treatment of mastitis. In no case was the udder freed of mastitis streptococci by the intravenous administrations of acriflavine or gonacrine.

At the same time 8 cows were subjected to penicillin treatment. The results were so encouraging that the whole herd will now be treated with penicillin. This should provide useful information on the value of this drug in the treatment of mastitis.

Horse Improvement Scheme at Ermelo.

The horse improvement scheme at Ermelo has been continued, and it is very popular with farmers. The service is of great value to the horse-breeding industry.

Kaalplaas and Onderstepoort Farms.

The work at Kaalplaas and Onderstepoort farms continues to be most satisfactory. The beef herd continues to make satisfactory improvement, and type uniformity is rapidly being attained. It has supplied cattle for all research purposes, and also meat for native rations, supplemented from Armoedsvlakte.

The calves born at Kaalplaas are used for various types of research: paratyphoid, heartwater and gallsickness, tuberculosis, contagious abortion and lumpy skin disease. It would be difficult to estimate the value of Kaalplaas to the Institute, both scientifically and economically.

The mares used for breeding are being used for observations on equine abortion, as well as to provide draught horses for use on the farms.

The breeding policy adopted with cattle is the crossing of Afrikander bulls and Sussex-native cows. The $\frac{7}{8}$-cross has been reached and the cattle have proved highly suitable for our conditions.

No winter concentrate feeding is given. Bonemeal and salt (2-1) are constantly accessible through self-feeding "hoppers". In spite of the dry winter conditions the cattle maintain good condition.

The Zulu herd continues to do well. Good progress has been made in achieving type uniformity.

The cattle, as they have developed, are considered an excellent type, being small and hardy. They are most resistant to our local diseases and to tick infestation.

The possibility of maintaining an infected herd and a herd free from contagious abortion on the same farm has been proved. The Zulu herd is infected and the other herd has remained free.

Small-Animal Section.

The breeding of small animals continues most satisfactorily. The demands of the various sections producing vaccine, etc., have all been met. This was made possible by the extended facilities provided last year. The following issues were made from this section:—

White mice	127,800
White rats	549
Rabbits	228
Guinea pigs	6,781
Ferrets	38

Attempts are constantly being made to improve our methods of management and breeding, and also to breed other species of small animals suitable for laboratory research.

Chemical Pathology.

Research.

(1) Large scale experiments are in progress in the coastal belt of the East London area with the new insecticides D.D.T. and benzene hexa-chloride (gammexane) against all external parasites of stock.

A large number of dipping tanks (about 30) have been filled with various strengths and formulations of these substances and regular dipping is being carried out under control. Dipping analyses are carried out both at the tanks and in the laboratory. Both substances have been found to be effective against the arsenic resistant blue tick. Questions in regard to the stability of both the emulsions employed and that of the substances themselves have as yet not been elucidated.

In the same series of experiments certain other dip formulas, e.g. that of Trollope and S. C. v. Rooyen, were also investigated. Both, however, proved to be of no value in combating the arsenic resistant blue tick.

All the work in connection with the manufacture of the vast amount of dip concentrates used in these dipping tests was undertaken by this section.

(2) Due to the staff shortage, only a portion of the important chemical and physical investigation of the dips could be undertaken. The investigation regarding a suitable field tester has hardly as yet received proper attention.

(3) In conjunction with other sections the following analytical work was undertaken:—

(*a*) Copper experiment (Pathology): determination of sugar, non-protein nitrogen: phenol and bile pigments in blood.

(*b*) Bio-climatological experiment (Physiology): same determination as before.

(*c*) Urea urine determinations (Physiology).

Pathology and Anatomy.

(*a*) *Specimens submitted for pathological examination*:—

Species.	Outside.	Onderstepoort.	Total.
Bovine	500	65	565
Ovine	62	100	162
Equine	57	29	86
Porcine	97	9	106
Canine	106	45	151
Feline	14	—	14
Avian	24	15	39
Caprine	5	—	5
Piscine	7	—	7
Game (various species)	39	1	40
Small lab. animals	—	73	73
Human	6	—	6
Unspecified	4	—	4
TOTAL	921	337	1,258

(*b*) *Post mortems*:—

Species.	Outside.	Onderstepoort.	Total.
Bovine	38	59	97
Ovine	20	390	410
Equine	—	37	37
Porcine	33	7	40
Canine	111	—	111
Caprine	—	17	17
Baboon	1	—	1
Jackal	—	1	1
TOTAL	203	511	714

(*c*) *Sections prepared for microscopic examination*:—

Paraffin-embedded sections	9,454
Frozen sections	5,020
Paraffin-embedded sections (for students)	1,006
Frozen sections (for students)	37
Paraffin-embedded sections (for students histology)	857
Frozen sections (for students histology)	233
	16,607

A large number of conditions of interest were encountered among the routine specimens received in the course of the year.

Research into the following conditions were continued or undertaken:—

(*a*) "Lamkruis", a demyelinating disease of lambs in certain coastal areas.

(*b*) Posterior paralysis in various domestic animals, with special reference to bovines.

(*c*) Affections of the nasal cavities in bovines, particularly in relation to carcinoma.

(*d*) Toxoplasmosis in dogs.

(*e*) Sterility in bovines, with special reference to the physiology and pathology of the genitalia and endocrine organs.

(*f*) Certain aspects of the pathology of lumpy skin disease and globidiosis.
(*g*) Various skin conditions in relation to the differential diagnosis of lumpy skin disease, e.g. onchocerciasis, demodectic mange, mycotic dermatitis and superficial necrosis of unknown aetiology.
(*h*) The pathology of canine piroplasmosis and nephritis.
(*i*) The spindlecell-lik epidermoid carcinoma of the skin of rats following continued exposure to sunlight (completed).
(*j*) The pathological anatomy, histology and cytology of the endocrine and reproductive systems of aged, late-bred sheep was undertaken as part of fertility experimental procedure in the Department of Surgery.
(*k*) The problem of vulvar cancer in Ayrshire cows was investigated in Natal, and observation is now being carried out on animals held under experimental control at Onderstepoort. Special attention is being given to the rôle played by sunlight.

Medicine and Therapeutics.

Rickettsiosis of dogs.—During the year an outbreak of this disease in the Pretoria district was investigated. The outbreak was diagnosed primarily in the south-western portion of Pretoria North. Later, further cases were detected in the Bon Accord-Pyramid area and Soutpan road north of Onderstepoort. The distribution consequently is fairly extensive and the future will undoubtedly reveal that many other parts of the Transvaal are infected. This is a disease which may seriously interfere with the dog population. The investigational work undertaken was mainly in connection with the improvements of methods of diagnosis, pathological anatomical changes, artificial transmission and chemo-therapy. Research in connection with the clinical, pathological and haematological changes in *Babesiosis* of dogs, and to a certain extent of bovines, continues.

Medical clinic for in- and out-patients.

Disease.	Animals Treated.	
	Small Animals.	Large Animals.
(1) Disease of digestive system	75	13
(2) Respiratory system	17	4
(3) Urinary system	12	—
(4) Nervous system	12	—
(5) Circulatory system	5	—
(6) Diseases of metabolism	4	1
(7) Protozoan diseases	164	11
(8) Rickettsia diseases	18	10
(9) Virus diseases	15	9
(10) Metazoan diseases	97	12
(11) Mycotic diseases	12	—
(12) Bacterial diseases	5	4
(13) Skin diseases	54	—
(14) Miscellaneous	43	20
TOTAL	533	84

Zootechnics.

During the year under review the staff position at Armoedsvlakte deteriorated further, and the changes adversely affected the station's work.

Experiment Work.—The "Pica Test", which was conducted over 4½ years, and aimed at elucidating the nature of osteophagia and allotriophagy in general, was concluded. The data await analysis and publication. The "Lick Test" in which cattle, free to take their phosphate supplement out of troughs, are compared with cattle which receive their supplement *per os*, was continued and amplified by the "Bonemeal *versus* Salt Equilibrium Test" which aims at determining whether it is possible to control the intake of a phosphatic supplement by adding salt. The indications so far are encouraging.

The main bionomic researches upon the four herds of grade cattle are being continued, but under the prevailing staff conditions the data collected cannot be written up.

Because the Meat Research Institute at Onderstepoort had no staff, the usual annual slaughter tests on steers bred at Armoedsvlakte could not take place and the steers were sold as surplus cattle.

Lumpy skin disease broke out on both Armoedsvlakte and Biesjesvlakte and close on 50 cattle were affected. Three pure-bred bulls became sterile as a result of the infection.

The high-grade Afrikander and Sussex bull calves, which were retained as grade bulls, at the request of the Division of Agricultural Education and Research, were sold by public auction as 2-year-olds. The Afrikanders sold very well, in fact better than the pure-bred Red Poll bulls. The Sussex, however, sold very poorly. There was practically no demand for them.

Meat Research.

The Meat Research Institute undertook no research work in abattoir or cold storage technique during the year.

During the year the Meat Laboratories slaughtered 149 cattle, 70 equines and 396 sheep, all for routine purposes.

Wool Research.

During the war a considerable volume of research, particularly on the fundamental properties of the fibre and on the by-products of wool, was conducted overseas. With the cessation of hostilities there is every indication that research on all aspects of wool will be intensified to a degree never before attained, and it is essential that South Africa should not lag behind other wool-producing countries in this respect.

During the past year wool research at Onderstepoort was continued along the lines indicated in previous reports, but the progress of the work was considerably retarded by the acute shortage of staff during the year. An improvement in the position is expected, and as a result an expansion of the work is envisaged.

The Yield of Wool.

The major part of the investigation has been concluded with the completion of approximately 1,200 tests on clips in collaboration with the British Wool Commission. It has been concluded that sample testing by the methods developed is reliable, for the error in yield is estimated to be smaller than 1 per cent. in 80 cases in a 100, and to exceed 2 per cent. in only one case in a 100.

The Yield Investigation Sub-Committee has submitted a final report to the Congress of the National Wool Grower's Association, and a new Sub-committee has been appointed to proceed with the matter. The laboratory has estimated the cost of a testing house capable of testing 30 lots per day, and the Sub-Committee's recommendation that such a testing house be erected has been referred by

the National Wool Grower's Association Executive to the S.A. Wool Council for further action.

The laboratory's investigations were conducted along the following main lines:—

(1) The sampling of clips for yield determinations.
(2) The testing of samples.
(3) The comparison of the results of sample tests and those of complete scouring and combing tests.

The results were a vindication of the methods developed.

In addition to the main problems, the following points were also investigated:—

(4) Yield of wool from different areas. Complete analyses of samples from the different wool-growing areas were carried out in order to study the peculiarities of the various types. This investigation is being continued.
(5) The reliability of human estimates. With the aid of Departmental officers the reliability of human estimates has been further investigated. The results confirm previous findings, viz. that the grease and sand contents of the wool are the main causes of erroneous estimation, and that appraisers tend to overestimate low yields and underestimate high yields. The value of tests as a guide to appraisers was again evident.

Wool Testing Service.

The analysis of fleeces for merino breeders and wool growers was continued. The experience gained during the past twelve years is laying increasing stress on the necessity of employing exact methods of judgment in breeding. The service consequently not only consists of the routine testing of samples and fleeces, but is also developing in the following directions:—

(1) The development of systems of recording for breeding records.
(2) Investigation of the reliability of tests on samples instead of on entire fleeces.
(3) The application of progeny testing to certain studs.
(4) The establishment of standards, based on accumulated data as regards the standard of production, conformation, and the variation of fleece characteristics.
(5) A special study of the weaknesses inherent in the practical judgment of the merino and its fleece.
(6) The development of methods of measuring fleece characteristics on a large scale, as required in breeding studies.

The Bio-climatological Experiment.

The investigation of the influence of climatological factors was continued. The wool-research laboratory is responsible for the fleece analyses, while the collaborating sections of Physiology, Statistics, Solar Radiation, Chemical Pathology and Sex Physiology are studying the meteorological factors and the animal functions.

Previously the sheep had been fed a sufficient ration, but during the past year the ration was reduced in order to study the influence of climatic factors under the adverse conditions usually met with during the winter months and during drought periods. The analysis and correlation of the results are proceeding.

The Influence of Age on the Merino Sheep.

Although this experiment has been completed, the analyses require a considerable number of routine measurements. The main

characteristics under investigation are conformation, wool production, fleece attributes, dentition and nose-prints.

The results will have an important application in sheep-breeding practice, but will also affect experimental technique. For example, the possibility of errors in the estimation of age by examination of the teeth has been clearly demonstrated, while a density test before the animal is full-grown has been shown to be unreliable.

The Characteristics of South African Merino Wool.

Following the principle that any application to practice is based on a thorough knowledge of the subject, the study of the basic characteristics of South African Merino wool has been continued unabated. The influence of nutrition and breeding is being studied, as also the relationship between the fleece characteristics, for it has been found that the study of any one attribute involves the study of several others.

Characteristics being studied include the following: fibre fineness, length, whiteness, tensile strength, extensibility, durability, surface friction, specific gravity and compressibility. An extension of this aspect of the work is contemplated with a view to including such characteristics as fibre contour and depth of crimp. In addition the part played by various factors in determining quality in wool will be investigated.

The investigation necessarily included the development of suitable methods of measurement and the modification of methods for application to determinations on a large scale. The study has been extended to include histological studies with a view to correlating the wool characteristics with those of the follicle population.

Wool Chemistry Research.

During the war enormous sums of money were spent on research into wool grease, with the result that the uses of wool grease and its secondary products have increased considerably. Approximately 50,000,000 lb. of wool are scoured annually in the Union, and most of the 6,000,000 lb. of wool grease is lost, besides, 1,500 tons of potash salts representing 20 per cent. of our total imports.

Research in this direction has been conducted along the following lines:—

(1) Wool grease determinations.
(2) Rapid methods of wool grease analysis at the scouring plant.
(3) Co-operation with washeries as regards specific problems.
(4) Tests on wool grease recovery (centrifugal system).
(5) Purification of wool grease.
(6) The constituents of wool grease.

Textile Testing.

Testing of textile for Government Departments has been continued. The laboratory has made a valuable contribution to the standardization of textiles, cotton wool, etc., during the past years. An agreement has been reached with the S. A. Bureau of Standards, whereby this body will in future undertake the routine testing of textiles while Onderstepoort will confine itself to the research aspect.

Analyses were carried out for the Stellenbosch-Elsenburg College of Agriculture. Members of the staff paid a fruitful visit to the Wool Research Laboratory at Grootfontein, and the Leather Research Institute at Grahamstown. Officers from Grootfontein paid a return visit to Onderstepoort.

During the past year advice was given to breeders and farmers, and assistance rendered to industrial and commercial undertakings

in regard to technical problems. An active part was taken in the deliberations of wool congresses.

The financial aid provided by the South African Wool Council is gratefully acknowledged.

Statistics.

Statistics as a science can only flourish in an atmosphere of vigorous research.

Continuing the work on the statistical analysis of time series, a new statistical coefficient, the *sequential variance*, has been constructed. This coefficient, summarizing the *form* of a time series, is the basis of a method for comparing two or more time series as a whole, thus eliminating the tedious and ambiguous processes which had to be used up till now. Seen from a biological point of view, this coefficient throws light on the *size and form* problem in morphology.

B.—Field Work.

As is customary, the report surveying the field work of the Division covers the period 1 July 1945 to 30 June 1946.

Lumpy Skin Disease.

The disease made its first appearance towards the end of December 1944 in the Marico district, and at the end of June 1945 the whole district was considered infected. The adjoining districts, viz. Rustenburg, Lichtenburg, Ventersdorp, Klerksdorp, Brits and Pretoria also became infected and with the advent of winter the spread of the disease was retarded, but during the summer months the disease spread further, resulting in the whole Province of Transvaal, the northern portion of Natal, the whole Orange Free State, excluding the southern portion and the northern districts of the Cape Province adjoining the Transvaal and Orange Free State provinces, also becoming infected. The disease also made its appearance in the Paarl district but the source has not yet been determined.

It is definitely a peculiar disease and has not responded to routine methods of investigation. It is believed to be insect-transmitted, and work to establish this in detail is proceeding at Onderstepoort.

The staff was increased to a great extent with a view to carrying out extensive inspections, and in order to control the movements of stock and avoid the spread of the disease, the area was divided into heavily and lightly infected areas and a buffer zone created in the Cape Province.

East Coast Fever.

Natal.—During the year there were no fresh outbreaks of East Coast fever in Natal and the position can be regarded as very satisfactory. Twenty-four farms in the Province became clean by lapse of time. Only three farms in the district of Vryheid remained in quarantine at the end of June.

During the year 520,903 deaths due to various causes occurred out of a cattle population of 2,739,478. The number of smears examined was 415,052, while 91,888 smears could not be examined owing to the acute shortage of staff. The position improved, however, as a result of the appointment of lay assistants at various centres in the Union.

Tranvaal.—There were no outbreaks of this disease during the year and the position is satisfactory. Quarantine was raised on one farm which had 43 deaths during the period 8 April to 11 November 1944 and which was cleared by slaughter on 27 and 28 November

1944. One farm which had one death on 16 March 1945 remained subject to control.

The number of smears examined was 98,065 as compared with 110,198 deaths.

Transkei.—There was one fresh outbreak in an old infected tank area, the Libode district, after 17 months without any deaths. One death occurred in a tank area which has been infected since February 1943.

The number of smears examined was 226,496 as compared with 229,757 deaths.

Eastern Cape Province.—This area remained free from East Coast fever.

The number of smears examined was 102,049, but a large number of deaths was attributed to the unprecedented drought.

Foot and Mouth Disease.

The Union remained free of infection during the period under review and precautionary measures were further relaxed in the eastern Transvaal. Control was, however, still exercised in certain portions of the eastern Transvaal in proximity to the Kruger National Park.

Anthrax.

There was an increase in the number of outbreaks in the various provinces, but the higher figure is partly explained by the intensive propaganda carried out amongst stock owners in areas known to be infected and resulting in a higher proportion of cases being detected.

Regular annual inoculations took place involving over two million head of cattle.

The following table indicates the incidence of the disease :—

Province.	No. of Outbreaks.	No. of Deaths.
Transvaal	114	451
Natal	70	261
Eastern Cape Province	52	125
Transkei	20	31
Western Cape Province	16	60
Orange Free State	52	180
TOTAL	324	1,108

Scab.

There were 11 outbreaks as compared with 10 outbreaks last year.

These outbreaks occurred in the following districts :—

District.	Outbreak.	Remarks.
De Aar	1	Origin unknown. District free from disease for years.
Hanover	1	Contact to outbreak in De Aar district.
Mafeking	2	Origin unknown.
Ermelo	5	Three attributed to introductions from adjoining territories.
Groblersdal	1	District previously infected.
Potgietersrust	1	Origin unknown.
TOTAL	11	

Goat Mange.

The following outbreaks were reported:—

Cape Province	48
Transkei	3
Transvaal	1
Natal	5
Total	57

The small-stock census produced the following figures:—

Woolled sheep	28,121,222
Non-woolled sheep	6,439,797
Angora goats	564,314
Other goats	5,207,105
Total	40,332,438

Mange in Other Animals.

Cases of mange were discovered in various areas and dealt with. The following outbreaks occurred:—

	Equine Mange.	Bovine Mange.
Cape Province	24	10
Natal	9	1
Transkei	24	8
TOTAL	57	19

Tuberculosis.

The number of herds under official test showed a slight decrease, but there is no doubt that if the necessary staff were available, many more breeders would come in:

	Herds.	No. Tested.	No. of Animals Infected.
Natal	7	2,454	8
Transvaal	14	1,417	91
Transkei	1	293	—
Eastern Cape Province	37	5,421	2
Western Cape Province	34	4,850	15
Orange Free State	13	801	2
TOTAL	106	15,236	118

One herd in the Pretoria district was tested for the first time with disastrous results. Out of a total of 222 animals, 62 positives and 10 suspicious reactors were encountered.

Nagana.

This disease caused very heavy mortality and spread to areas where it had not occurred for many years.

It is estimated that the nagana position from October 1945 to June 1946 was as follows:—

Division.	Infected Areas.		Estimated Mortality.
	Native.	European.	
Eshowe	20	94	5,500
Nongoma	37	83	10,200
Vryheid	—	37	6,600
Total	57	214	22,300

Discriminate bush clearing was undertaken to prevent dispersion of the fly from high density areas, as well as the destruction of game, the food supply of the fly, in the potential fly area.

D.D.T. dusting was undertaken by means of aeroplanes and smoke generators.

Rabies.

Outbreaks were dealt with as they were discovered.

The following cases were diagnosed either histologically or biologically:—

	No. of Outbreaks.	Species.
Cape Province	2	Canine and bovine.
Orange Free State	8	1 Canine, 2 bovines, 3 felines and 2 meercats.
Transvaal	1	Feline.
Total	11	

Dourine.

This disease occurred in various parts of the Union and, unfortunately, owing to the lack of staff it was not possible to continue with block tests. The Natal Province remained free from the disease.

Newcastle Disease.

This disease was controlled by restricting the movement of poultry and slaughtering out the last focus of infection at Lamontville, Durban, in January 1946.

There were no further outbreaks.

Non-Scheduled Diseases.

Tick-transmitted diseases, redwater, anaplasmosis and heartwater were prevalent and responsible for heavy losses, particularly in areas where regular dipping of cattle is not enforced.

Arsenic-Resistant Blue Tick.

Experiments were carried out with D.D.T. and gammexane and satisfactory results were obtained. Limited supplies of gammexane arrived in the Union recently and it is hoped to be able to make D.D.T. available for use in cattle dips at an early date.

Certain South African firms have already included these substances in their proprietary products.

Staff Position.

The position regarding Government veterinary officers remained acute and extreme difficulty was experienced in obtaining candidates to fill vacancies.

During the period under review eight Government veterinary officers resigned from the Service, one was transferred to the Division of Agricultural Education and Research, while it was possible to make only nine new appointments.

Review of Agricultural Production and Prices in the Union from 1939.

S. J. de Swardt, B.A., M.Sc., Chief of the Division of Economics and Markets.

IN surveying the economic aspects of our agricultural industry in the first full year of peace, it will be profitable to draw a comparison not only with the preceding year, but also with the whole war period. The past year can be regarded as the introductory period of the re-adjustment of our agriculture to peace-time conditions and the direction into which our agricultural industry has been guided by the war up to the last year, therefore, serves as the starting-point for the new trend which can be expected from this year.

Agriculture the world over has played an important rôle during the war, and ever-increasing demands have been made on agriculture in the Union to contribute to the maintenance of the civilian population as well as the military forces of the Union and the allied nations.

Price control was introduced during the war years mainly to counteract inflation. The prices of food products had, however, to be raised periodically in order to cover the rising costs of production and cost of living of farmers, and to encourage the latter to increase their production. In spite of this encouragement, however, it became apparent at an early stage during the war that agriculture could not fully meet the rapidly increasing demand, and it was considered essential to regulate, by means of control measures, the consumption of the more important food products. The factors which had an especially limiting effect on agricultural production were:

(1) unfavourable climatic conditions;

(2) a shortage of the means of production like fertilizers, tractive power, good seed, etc., and

(3) a shortage of labour, owing to recruitment to the forces.

Nevertheless, the farmers of the Union largely satisfied the higher demands made on them during the war. The production of all agricultural products in the Union is estimated to have increased by approximately 10 per cent., and the area under cultivation by 14 per cent. since 1939, and this in spite of the impeding factors with which farmers had to cope. Of these factors, unfavourable weather conditions had by far the most important limiting effect on prodction.

Prices of Agricultural Products.

Table I indicates the average annual price index of the main groups of field crops and animal products as well as the price index for all these groups combined, based on the averages for the three years immediately preceding the war, viz. 1936-37 to 1938-39.

The table reveals that the combined price index for all groups of agricultural products rose steadily during the war from 103 points in 1939-40 to 169 points during the past year.

The general advance in prices is to be attributed mainly to a condition of practically continuous relative shortages of agricultural products to meet the increased demand during the war years as well as the past year, and to cover increased production losses.

TABLE I.—*Price Index of Agricultural Products* (1936-37—1938-39 = 100).

Season (1st July to 30th June).	Summer Cereals.	Winter Cereals.	Hay.	Other Field Crops.	Pastoral Products.	Dairy Products.	Slaughter Stock.	Poultry and Poultry Products.	Combined Index.
	(*a*)	(*b*)	(*c*)	(*d*)	(*e*)	(*f*)	(*g*)	(*h*)	
Weight :	19	13	2	3	34	6	17	6	100
1938–39	92	107	96	89	79	102	106	92	93
1939–40	86	107	77	95	115	105	106	89	103
1940–41	109	113	106	156	102	108	110	104	108
1941–42	121	134	143	203	102	131	134	145	123
1942–43	160	149	144	159	122	147	167	173	146
1943–44	169	172	137	212	122	154	182	204	157
1944–45	184	183	160	280	122	177	172	187	163
1945–46	203	188	164	314	118	198	176	193	169

(*a*) Maize and kaffircorn.
(*b*) Wheat, oats and rye.
(*c*) Lucerne and teff hay.
(*d*) Potatoes, sweet potatoes, onions and dried beans.
(*e*) Wool, mohair, hides and skins.
(*f*) Butter, cheese, milk and condensing milk.
(*g*) Cattle, sheep and pigs.
(*h*) Fowls, turkeys and eggs.

In Table II the price index of agricultural products is compared with the general wholesale price index, as compiled by the Department of Census and Statistics and converted on the basis 1936-37—1938-39 = 100.

TABLE II.—*Comparison between Price Index of Agricultural Products and Wholesale Price Index* (1936-37—1938-39 = 100).

Year.	Price Index of Field Crops and Animal Products.	Wholesale Price Index.
1938–39	93	100
1939–40	103	105
1940–41	108	116
1941–42	123	128
1942–43	146	146
1943–44	157	153
1944–45	163	155
1945–46	169	158

From the above table it appears that compared with wholesale prices, the prices of agricultural products were, on the whole, lower until 1942-43, when the two series showed equal rises as compared with prices ruling during the basic period of 1936-37 to 1938-39.

Subsequently, and up to the past year, prices for agricultural products rose slightly more than general wholesale prices.

Considering the general tendency for agricultural prices to rise rapidly and to high levels during war-time and, in addition, the comparatively serious shortage of agricultural products during the war years and up to the present time, the prices of agricultural products could have been expected, without price control, to rise much higher in comparison with general wholesale prices than was actually the case.

Although the combined index of agricultural prices has risen higher since 1943-44 than the general wholesale price index, it does not necessarily follow that farmers were more prosperous than the rest of the population—i.e. the population group dependent on wholesale prices.

On the contrary, if regard is had to the poor crops actually obtained, and their comparatively high cost, it is obvious that it was by no means as prosperous a period for the farming community as is believed in some circles.

The way in which the prices of the most important production requirements have risen from 1939 to 1946 is reflected in Table III below, which gives the price indexes of farming requirements.

TABLE III.—*Indexes of Prices Paid for Farming Requisites.*

Year.	Implements.	Fertilizers.	Fuel.	Bags.	Feeds.	Fencing Material.	Dips and Sprays.	Building Material.
1939........	105	105·6	94·5	133·4	90·7	110·6	100·0	102·3
1940........	120	132·3	111·1	178·8	93·9	172·1	112·0	123·6
1941........	124	166·4	124·2	174·5	109·9	207·7	115·0	145·7
1942........	123	157·3	139·6	207·0	135·5	229·4	·117·0	168·1
1943........	130	170·8	154·4	237·2	152·3	239·0	127·0	179·3
1944........	161	184·1	155·7	309·9	154·7	239·9	134·0	183·6
1945........	159	203·6	153·9	315·5	164·9	224·5	135·5	180·4
1946........	153	201·4	138·4	308·3	165·1	215·0	134·3	175·2

Although the Division possesses no data based on actual investigations throughout the country, there is information indicating that farm labour costs have risen from 50 to 100 per cent. and, in exceptional cases, even more, during the war.

Agricultural conditions during the past year.

During the past year, every branch of agriculture was detrimentally affected by various factors, especially climate. While the winter-rainfall area had abundant rains during the winter of 1945, which damaged the crops, the summer-rainfall area was stricken by a severe drought. When the drought was eventually broken, only at the beginning of 1946, it rained so incessantly in some areas that the crop-producer found proper cultivation of his crops extremely difficult, especially on the heavier soils.

Although an additional 25,000 tons of fertilizer was made available to maize producers during the planting season, it could not be put to full use owing to the drought. Even after the rainy season had commenced, the farmers could not plough their lands in time with worn-out tractors and thin oxen.

On the whole, crops were put in very late in the season in the summer-rainfall area and if the frost had not been so late at the beginning of the winter of 1946, yields would have been considerably smaller.

As far as the stock industry is concerned, losses were enormous on account of the drought. Sheep farmers in the Cape Province and cattle farmers in the south-eastern districts of the Cape Province and in the Northern Transvaal were exceptionally severely affected. In addition, lumpy-skin disease caused considerable damage among cattle in the Transvaal and the Orange Free State, as did nagana in Natal.

Wool.

At the beginning of the war, the sale of wool by public auction was discontinued, clips thereafter being disposed of to the British Wool Commission at fixed prices under agreement. Between 1940-41 and 1945-46 the country's entire production was sold in this way.

The 1946-47 clip will be sold by public auction, subject to a reserve price.

The quantities of wool bought annually by the British Wool Commission were as follows:—

Year.	*Purchases (grease-wool basis).* lb.
1940–41	244,290,000
1941–42	239,940,000
1942–43	226,550,000
1943–44	221,073,000
1944–45	201,366,000
1945–46	209,717,000

Mohair.

As in pre-war years, mohair was sold by public auction during the war.

Table IV indicates the receipts of exportable mohair at Union ports as well as the average export of mohair per pound.

Table IV.*—*Receipts of Mohair at Union Ports, and Average Export Values.*

Year.	Amount.	Average Value per lb.
	lb.	s. d.
1940–41	4,874,000	17 8
1941–42	4,199,000	15 2
1942–43	3,570,000	15 1
1943–44	4,064,000	15 8
1944–45	3,082,000	21 0
1945–46 (5 months)	2,500,000	17 0

* Union mohair only.

Hides and Skins.

As a result of the war, the export of skins and hides practically came to a standstill. With Government co-operation, however, contracts were obtained for the local manufacture of military footwear (about 3 million pairs per year).

As a result, the local demand for wet-salted hides reached unprecedented heights.

In 1942 these hides, as well as such dry-salted and sun-dried hides as were required by local tanneries, were placed under control, subject to permits issued by the Controller of Leather, and maximum prices.

In 1945 goat skins, coarse and coloureds and glovers were also placed under control and maximum prices fixed. These skins, especially the two former types, are required for the manufacture of light leather, i.e. uppers and linings. Formerly, local tanneries never concentrated on the manufacture of this leather, which was always imported from overseas. The import position, however, gradually deteriorated during the war and consequently the local manufacturing of light leather was resorted to.

The control of glovers was abolished as from the beginning of 1946. The Union's consumption of this type of skin is small and only exports are still subject to permits. Merino skins, cross-bred sheepskins, karakul pelts and Angora skins have never been subjected to control. Controlled skins and hides not used locally could, however, always be exported under permit. After termination of the military contracts in September of this year, it was decided in some cases to release a larger proportion for export under permit, viz. 40 per cent. of the hides, 20 per cent. of the dry-salted hides and two-thirds of the goatskins. In the case of wet-salted hides and coarse and coloureds, however, no exporting will as yet be allowed.

Table V reflects the annual exports of hides and skins from 1939 to 1944.

TABLE V.—*Exports of Hides and Skins.*

Year.	Hides.	Goat Skins.	Sheep Skins.
	(lb.)	(lb.)	(lb.)
1939	19,869,635	5,385,341	39,487,702
1940	18,011,020	5,077,254	32,596,224
1941	23,059,454	5,522,599	34,879,234
1942	14,019,071	5,387,109	33,846,906
1943	6,767,813	4,003,309	21,592,558
1944	4,559,270	2,279,053	25,105,803

Table VI shows the annual average prices paid for hides and skins at the Port Elizabeth auction mart.

TABLE VI.—*Average Annual Prices for Hides and Skins at Port Elizabeth* 1938-39—1945-46.

Year.	Hides.		Glovers.	Angora Skins.	Woolled-sheep Skins.		
	Sun-dried, Firsts.	Dry-salted, Firsts.	Sound.	Sound.	Long Wool.	Medium.	Coarse Wool, Sound.
	Per lb. d.	Per lb. d.	per Piece. s. d.	Per lb. d.	Per lb. d.	Per lb. d.	Per lb. d.
1938–39	6·0	5·5	2 9	6·06	4·8	4·1	4·6
1939–40	7·8	7·9	3 8	6·4	6·3	5·4	5·9
1940–41	5·8	6·0	2 10	3·6	6·2	4·9	4·1
1941–42	7·2	7·3	4 0	5·4	7·0	5·1	5·9
1942–43	7·8	8·2	3 5	6·0	8·1	5·7	5·3
1943–44	8·3	9·4	4 8	7·4	7·0	5·5	6·8
1944–45	8·5	9·5	5 3	9·0	7·0	5·8	9·4
1945–46	8·5	9·5	7 7	10·0	9·6	8·5	11·8

Meat.

Table VII shows the numbers of slaughter stock according to census returns, slaughtered annually during the period 1939 to 1944, at all abattoirs in the Union.

Although considerably larger numbers of slaughter stock of all classes were slaughtered during the war years than in 1939, meat was by no means plentiful in the Union during the war, owing to the increased demand. In the large cities especially, meat was frequently in short supply. Military requirements could not be met

TABLE VII.—*Stock Slaughtered Annually at Union Abattoirs in:—*

Year.	Sheep, Lambs and Goats.	Cattle.	Calves.	Pigs.
1939	3,510,845	643,282	63,098	286,864
1940	3,813,493	708,386	66,377	351,502
1941	4,375,645	800,572	79,896	441,413
1942	4,597,097	857,422	83,702	535,644
1943	4,136,436	843,044	84,120	514,725
1944	3,474,252	710,683	87,081	533,928
1945	Not yet available.			

through the usual channels and already at an early stage in the war the Government decided to buy slaughter stock for this purpose on the open market in the Union as well as in South-West Africa.

In 1942 the meat markets in certain areas in and in the vicinity of the large cities were placed under the control of the Food Control Organization, which was instituted during that year, and retail meat prices fixed. The Organization also supplied meat for military purposes.

The determination of retail prices only did not, however, have the desired effect of also stabilizing the prices of slaughter stock, and consequently a Meat-control Scheme was introduced in the controlled areas in May, 1944. One of the most important features of the Meat Scheme was the fixation of producer's prices for grades and carcase weight in the controlled areas. All slaughter stock marketed in the controlled areas is bought by the Food Controller at the fixed prices.

As will be observed from Table VII, there has on the whole been a decline in the number of stock slaughtered since 1943.

Since most of the stock is, however, slaughtered in the larger areas, where the acute shortage of meat has developed, the numbers slaughtered in the controlled areas are shown in Table VIII.

TABLE VIII.—*Numbers of Stock Slaughtered in Controlled Areas.*

Year.	Sheep.	Cattle.	Calves.	Pigs.
1940	2,426,393	509,236	57,090	259,763
1941	2,899,467	585,862	68,502	326,813
1942	3,068,919	638,104	74,855	375,999
1943	2,622,329	607,015	75,797	367,478
1944	1,967,152	496,622	78,559	372,412
1945	1,940,015	575,835	82,042	393,715
1945, Jan.-Aug.	1,207,926	423,635	52,754	260,676
1946, Jan.-Aug.	1,104,312	476,314	53,223	211,372

The above figures indicate that, as far as stock slaughterings in the controlled areas are concerned, a general decline set in in 1944. The position improved slightly in 1945, as compared with 1944. During the first eight months of 1946, however, considerably fewer sheep and pigs were slaughtered in controlled areas than during the first eight months of 1945—probably owing to the drought during the summer of 1945-46 and the general shortage of concentrates.

The Union's meat supplies were supplemented to a considerable extent by slaughter stock from adjoining territories. Receipts from these territories reached their maximum in 1943, however, since when the figures have declined, as shown in Table IX.

TABLE IX.—*Slaughtered Stock received from Adjoining Territories.*

Year.	Cattle.	Sheep (from S.W.A.).
1941	107,419	121,874
1942	123,858	189,417
1943	132,092	183,868
1944	115,193	135,240
1945	102,317	20,764

During the first half of 1946, however, there was a considerable increase in the number of cattle received from adjoining territories in comparison with the figures for the first half of 1945.

Prices to producers showed a steady increase until price control was introduced and brought into operation under the meat scheme.

Cattle prices reached their peak in 1943-44, but prices for sheep and pigs are still showing a steady upward tendency, as will be seen from Table X, which shows producer's prices on the Johannesburg meat market.

TABEL X.—*Meat Prices* to Producers at Johannesburg.*

	1939–40.	1940–41.	1941–42.	1942–43.	1943–44.	1944–45.	1945–46.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Beef: Average for good, medium and compounds, per 100 lb.	33 1	35 6	43 8	52 5	59 11	56 1	57 1
Mutton: Medium Merino, per lb.	6.0	6.2	7.6	9.9	10.4	10.3	11.0
Pork: Average for porkers and baconers, per lb.	5.1	4.6	5.4	7.5	7.4	7.9	8.0

* From 1944–45 onward, the prices are calculated prices allowing for offal, hides and skins.

Owing to the gravity of the shipping position during the war, it was extremely difficult to import meat. Nevertheless, imports of all types of meat increased considerably, as appears from Table XI.

TABLE XI.—*Imports of all Types of Meat.*

	1938.	1939.	1940.	1941.	1942.	1943.	1944.
Import, million pounds	10·1	10·2	11·6	16·9	16·6	11·8	7·0

During the 1944-45 season, 80,000 sheep carcases were imported from Australia.

Dairy Products.

Despite considerably increased production, dairy products were in comparatively short supply during the war years, owing mainly to an increased demand. Rationing frequently became necessary.

Table XII reflects the production of creamery butter and cheese in the Union for the period 1939-40 to 1945-46:—

TABLE XII.—*Production of Creamery Butter and Cheese in the Union* (1939-40—1945-46). (*October-September Season*).

Year.	Butter Production.	Cheese Production.
	lb.	lb.
1939–40	44,810,000	13,980,000
1940–41	44,955,000	13,570,000
1941–42	40,440,000	15,859,000
1942–43	42,281,000	15,955,000
1943–44	42,741,000	15,325,000
1944–45	39,043,000	15,870,000
1945–46	33,817,000*	14,125,000*

* Provisional figures.

During the past year the producton of both butter and cheese was exceptionally low in comparison with that of previous years, largely owing to the drought which ravaged the country towards the end of 1945. As Table XIII indicates, the prices for butter-fat and cheese milk were continually raised during the war to enable producers to cover their steadily increasing production costs.

TABLE XIII.—*Weighted Average Prices (including winter premiums) for Butterfat and Cheese Milk* (1939-40—1945-46). *November-October Season*).

Year.	Butterfat Prices.	Cheese-milk Prices.
	Per lb.	Per Gallon.
	d.	d.
1939–40	14.3	5.7
1940–41	14.6	6.8
1941–42	18.5	9.1
1942–43	19·7	9·8
1943–44	20·5	9·8
1944–45	23·9	11·0
1945–46	27·1*	11·9*

* Provisional figures.

Butter and cheese imports and exports for the years 1939 to 1944 are shown in Table XIV.

TABLE XIV.—*Imports and Exports of Butter and Cheese* (1939-1944).

Year.	Imports.		Exports.	
	Butter.	Cheese.	Butter.	Cheese.
	lb.	lb.	lb.	lb.
1939	25,000	282,000	6,928,000	4,253,000
1940	1,000	124,000	6,763,000	2,360,000
1941	249,000	56,000	4,382,000	550,000
1942	828,000	54,000	1,699,000	578,000
1943	1,722,000	30,000	1,435,000	536,000
1944	74,000	79,000	1,121,000	440,000
1945	Not availa	ble.		

Cheese was exported to England up to 1940, and butter up to 1941, after which dates these commodities were exported mainly to African territories.

Poultry and Eggs.

Although no exact figures are available, there are indications that the production of poultry and eggs was expanded during the war years, despite the comparative shortage of poultry feed. During 1944-45, for instance, 14,399,000 dozen eggs were sold by dealers and egg-circles, the figures for the 1945-46 season being 14,428,000 dozen. During the five months, April to August, 1946, 4,602,000 dozen were sold as against 4,423,000 dozen during the same months of 1945. The August sales for 1946 are also considerably higher than those for August, 1945, viz. 1,869,000, as against 1,387,000 dozen. Owing to the meat shortage there was a strong demand for eggs and slaughtered poultry practically throughout the period, and prices of poultry and eggs as a group rose higher than those of any other group of animal products.

In 1942 a purchasing scheme was instituted, whereby the Food Controller became sole buyer at fixed prices of the best grades of *surplus* eggs during the season of plenty and gained sole control of all cold-storage eggs. These cold-storage eggs were again released during the season of scarcity and disposed of at fixed prices.

Since December 1943, maximum prices have also been fixed for all eggs and table poultry in the controlled areas.

These measures have had a stabilizing effect on producers' and consumers' prices.

The egg-purchasing scheme has been in operation every year since its inception, including 1946. The prices paid under the purchasing scheme during 1946 have been fixed as follows:

On 19.7.46: 1s. 9d. for First grade, large, and 1s. 7d. for First grade, medium. On 9.9.46: 1s. 8d. for First grade, large, and 1s. 6d. for First grade medium.

The latter prices were still in force on 31 August, 1946. From 3 September, 1944, to July, 1945, 1,950,922 boxes of eggs containing 30 dozen each were bought under the purchasing scheme, 2,713,366 boxes being bought during the period 4 August, 1945, to 8 June, 1946.

Wheat.

The production of wheat varied considerably from season to season over the period 1938-39 to 1945-46, mainly because of the instability of production in the Transvaal and especially in the Orange Free State. The estimated crop of the Orange Free State, for instance, varied between 2,632,000 bags in 1942-43 and 267,000 bags in 1944-45, that of the Transvaal between 846,000 bags in 1943-44 and 409,000 bags in 1945-46, whereas the crop in the Cape Province varied between 3,005,000 bags in 1938-39 and 2,311,000 bags in 1945-46. With the exception of the 1945-46 crop, when the wheat crop in the western Cape Province was considerably damaged by excessive rains, the nature of the Union's crops during the 8 years under review, poor as well as good, was on the whole dependent on that of the Transvaal and Orange Free State crops.

Table XV shows the wheat-production figures, (according to threshing results, to which a certain percentage has been added for hand-threshed wheat) and prices including extra allowance of wheat during the period 1938-39 to 1945-46.

Since the wheat requirements of the Union in recent years have been estimated at approximately 6 million bags, it is obvious that the Union could not meet its own requirements during the war. The

TABLE XV.—*Production and Prices of Wheat during the period* 1938-39 *to* 1945-46.

	1938–39.	1939–40.	1940–41.	1941–42.	1942–43.	1943–44.	1944–45.	1945–46.
Production in thousands of bags (of 200 lb each)....	5,089	4,593	4,692	3,945	6,244	5,384	3.424	2,849
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d
Prices for Class B, Grade I..	21 0	22 0	23 0	27 3	30 0	35 11	36 0	37 6

available supplies had to be supplemented by imports and, in addition, measures had to be introduced to ensure economical consumption of these supplies. Consequently, the standard loaf was introduced in 1941 and the free baking of white bread prohibited by a regulation which is still in force to-day, and which also imposed restrictions on the manufacture and use of flour. In 1946 the weight of the standard loaf was reduced from 32 to 29 ounces.

As is shown by Table XVI, wheat and flour have been imported every year since 1939.

TABLE XVI.—*Wheat and Flour Imports* 1939-1944.

Year.	Wheat	Flour.
	Tons.	Tons.
1939..............................	5,428	499
1940..............................	85,108	3,265
1941..............................	44,306	11,869
1942..............................	128,355	17,921
1943..............................	26,550	7,475
1944..............................	11,474	8,940
1945..............................	Not available.	Not available.
1946..............................	,,	,,

The export of wheat during the period 1939-1944 was minimal. In 1941, 1,030 tons were exported, and during each of the years 1939, 1940 and 1942 only 10 tons.

Although wheat prices were continually increased, bread prices to the consumer were kept at practically the same level by meeting the rise in wheat prices with a subsidy.

Oats.

Table XVII shows the oat yield for the Union as well as the average price for oats during the light-year period:

TABLE XVII.—*Estimated Oat Crops and Weighted Average Prices of Oats during the period* 1938-39 *to* 1945-46.

	1938–39.	1939–40.	1940–41.	1941–42.	1942–43.	1943–44.	1944–45.	1945–46.
Estimated crop (in thousands of bags of 150 lb each)	1,569	1,249	1,352	1,230	1,366	1,625	2,248	1,946
Average price per bag....	s. d. 9 0	s. d. 10 4	s. d. 12 4	s. d. 14 1	s. d. 15 2	s. d. 15 2	s. d. 15 2	s. d. 12 3

As in the case of wheat, the production of oats in the western Cape Province was considerably less uncertain than in the Transvaal or the Orange Free State. On the whole, the table reflects a gradual increase in the production of oats up to 1944-45. The crop for 1945-46 was poorer than that of the previous year, owing to unfavourable climatic conditions—excessive rains in the western Cape Province and drought in the northern provinces.

Prices increased from 1939-40, till they were fixed at 15s. 2d. per bag (average for all grades of fodder oats) in November 1942. In November 1945 the fixed price was decreased to an average of 12s. 3d. per bag for all grades.

Barley.

On the whole the production of barley also increased over the eight years, as is shown in Table XVIII.

TABLE XVIII.—*Estimated Production and Average Prices of Barley during the period* 1938-39 *to* 1945-46.

	1938–39.	1939–40.	1940–41.	1941–42.	1942–43.	1943–44.	1944–45.	1945–46.
Estimated crop (in thousands of bags of 150 lb each)....	498	461	529	610	526	640	809	603
Average price per bag (Malt barley, Gr. I, Class A)....	s. d. 16 0	s. d. 16 0	s. d. 17 0	s. d. 17 0	s. d. 18 6	s. d. 21 0	s. d. 21 0	s. d. 21 0

About 90 per cent. of the Union's barley is produced in the Cape Province, and although production in the Transvaal more than doubled itself over the period, the increase in the total crop is attributable largely to the expansion of barley production in the Cape Province.

The prices shown in the table are for six-row malt barley, class A, grade I, and reflect the rise in prices over the period. The prices of other classes and grades were fixed relative to those for class A, grade I, malt barley. From November 1942, barley was placed under control together with rye and oats, and prices were fixed. The Wheat Control Board exercised control and was the sole buyer of barley.

Rye.

Contrary to the case of oats and barley, there was, on the whole, only a slight increase in the total production of rye in the Union during the period under review, as appears from Table XIX.

TABLE XIX.—*Estimated Production and Average Price of Rye during the period* 1938-39 *to* 1945-46.

	1938–39.	1939–40.	1940–41.	1941–42.	1942–43.	1943–44.	1944–45.	1945–46.
Estimated crop (in thousands of bags of 200 lb. each)....	236	221	201	187	225	258	291	234
Average price per bag.....	s. d. 12 7	s. d. 15 1	s. d. 18 0	s. d. 29 6	s. d. 22 8	s. d. 22 8	s. d. 22 8	s. d. 24 2

The Cape Province produces more than 90 per cent. of the Union's Rye, the Transvaal and Natal very little.

Although there was a annual decrease in the crop up to 1941-42, prices rose steadily up to that year, but fell in 1942-43, mainly as a result of the introduction of price control in November 1942, when prices were fixed at 23s. 6d. per bag for grade I, and 23s. and 21s. 6d. for grades II and III, respectively, which meant an average price of 22s. 8d. per bag for all grades. In November 1945, the price was increased by an average of 1s. 6d. per bag.

Maize.—Except during two seasons, the Union's maize crop has been below normal every season since 1939-40, due mainly to unfavourable climatic conditions and a shortage of the means of production, like fertilizers, etc.

Maize prices have been fixed since 1941-42 and during that season the prices to farmers were 15s. per bag for the best grades. Subsequently annual increases were granted to compensate farmers for higher costs of production and the rising cost of living, and in order to encourage production.

Table XX shows the estimated maize crops for the seasons 1938-39 to 1945-46, as well as the weighted average price to producers for the best grades (two's and sixes) of maize for the seasons 1938-39 to 1940-41 and, thereafter, the fixed price for the best grade at which the crop was marketed in the corresponding season.

TABLE XX.—*Production and Prices of Maize* 1938-39—1945-46.

Year.	Estimated Production.	Price per Bag.
	Bags.	s. d.
1938–39	29,020,000	8 1
1939–40	20,701,000	10 1
1940–41	24,323,000	11 0
1941–42	16,341,000	15 0
1942–43	24,336,000	16 0
1943–44	18,371,000	17 6
1944–45	18,387,000	19 0
1945–46	18,131,000	22 6

The annual consumption of maize in the Union is estimated to have risen to the neighbourhood of 22 million bags during the war, with the result that the crop was not sufficient from year to year. Owing to the comparative shortage of maize, steps were taken at an early stage in the war for the conservation and economical consumption of the Union's limited available supplies. In addition to other measures, the export of maize and maize products was restricted, and local consumption has been regulated by a permit system since 1942 in order to ensure that maize is used primarily for human consumption and the production of important protective foods. The regulation of maize consumption has been steadily maintained up to the present, and has, if anything, been enforced even more rigidly as available supplies dwindled. Owing to the critical nature of the shipping position during the war, it was practically impossible to supplement the supply with imports.

In 1942 the Maize Control Board was authorized to become the sole buyer of maize in grain elevators and later in the same year also took over all maize stocks from co-operative societies. Since 1943, the Maize Control Board has been sole buyer of all maize, and agents

have been appointed to do the purchasing on behalf of the Board. The Board, therefore, also obtained physical control over maize and was thus enabled to ensure equitable distribution.

In Table XXI the export of maize and mealiemeal is shown in thousands of tons for the years 1939 to 1944.

(later figures were not available):

TABLE XXI.—*Export of Maize and Mealiemeal* (1939-1944).

Year.	Maize.	Mealiemeal.
	Tons.	Tons.
1939	704,000	177,200
1940	465,600	80,000
1941	185,000	27,600
1942	22,600	3,800
1943	700	4,400
1944	4,500	6,400

The past season's crop, which is estimated at slightly more than 18 million bags, was very seriously affected by the severe drought during the latter half of 1945. In most areas, farmers could do no ploughing and planting until very late in the season, and although and additional 25,000 tons of fertilizer were allocated to certain districts, the drought prevented farmers from making full use of it. Fortunately frost was exceptionally late at the beginning of the winter of 1946, as a result of which considerably more maize was harvested than would otherwise have been the case. The crop is, however, still inadequate for the nation's requirements and allocations for human and animal consumption had to be curtailed from time to time during the year. Efforts at importing maize, chiefly from the Argentine, were successful.

Kaffircorn.

Table XXII shows the estimated kaffircorn crop for the seasons 1938-39 to 1945-46, as well as the average annual prices for the relative crops.

TABLE XXII.—*Estimated Crop and Average Prices of Kaffircorn.*

	1938–39.	1939–40.	1940–41.	1941–42.	1942–43.	1943–44.	1944–45.	1945–46.
Estimated crop (in thousands of bags of 200 lb. each)....	732	587	729	555	1,432	1,473	558	788
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Average price	8 9	16 7	18 8	24 11	21 7	18 6	20 6	59 7*

* Average for May-August, 1946.

The table reveals that the kaffircorn crops were exceptionally good during the 1942-43 and the 1943-44 seasons, the Transvaal crop being approximately three times as large as usual, probably because of the good rains which fell in the western and northern drier parts of the province.

Prices fluctuated from season to season and showed a rising tendency over the whole period, partly owing to the continued maize shortage. At the beginning of 1945, kaffircorn was also placed under control with a maximum price of 22s. 6d. per bag, which was, however, fixed at 20s. 6d. per bag as from 1 May 1945. The supply of kaffircorn offered to the controlling body (the Maize Control Board) during the selling season was so small, however, that control was lifted in May 1946, after which the price immediately rose to about £3 10s. per bag. Subsequently, however, the price declined fairly sharply, to 48s. 5d. per bag in August.

The past year was more favourable for kaffircorn than the previous one because of the good rains which fell in the drier western and northern areas of the Transvaal at the beginning of 1946.

Hay.

The unfavourable climatic conditions during the year had an exceptionally detrimental effect on lucerne production, but on the other hand the late rains were favourable for the production of teff. Grazing was poor during the summer months, but the late rains and the exceptional mildness of the winter up to July, coupled with the lateness of the maize crop, ensured an abundance of roughage in most parts of the country.

As far as lucerne hay is concerned, market figures do not reflect the actual position. Owing to the shortage of maize and protein feeds, lucerne was largely disposed of by direct sale. Nonetheless Johannesburg market figures show that for the year (up to the end of August 1945) a total of 250,182 lucerne units of 100 lb. were sold as against only 47, 292 units in 1946. On the other hand railway transportation figures for the most important lucerne areas for the eleven months ending June 1946, show that a total of 204,000 tons were transported, as against 181,843 tons during the same period up to June 1945.

In contrast to this, there has been a considerable increase in the sale of teff on the same market. For the year (up to August 1946), 148,703 100 lb. units were sold, in comparison with 69,895 in 1945.

Owing to unfavourable climatic conditions and the shortage of maize and protein feeds, the demand for lucerne was exceptionally heavy with prices at the maximum practically throughout the period.

In order to maintain quality, it was prescribed by regulation that lucerne hay shall not contain more than 15 per cent. of foreign feeds. The following price fixations were made known during the year (from 16 November 1945)—

Maximum selling prices, per 100 lb.

	Lucerne.	Teff.
	s. d.	s. d.
For producers	6 0	5 0
For co-operative societies	6 3	5 3
For traders	6 9	5 9
To consumers	7 0	6 0

These prices may be increased by the amount of railage actually paid, plus 1d. per mile per 100 lb. for motor delivery.

The trend of lucerne and teff-hay prices on the Johannesburg market during the war is indicated in Table XXIII.

TABLE XXIII.—*Average weighted price per* 100 *lb. for Lucerne and Teff on the Johannesburg Market,* 1939-40—1945-46.

Year.	Lucerne.	Teff.
	s. d.	s. d.
1939–40	3 0	2 6
1940–41	4 2	3 3
1941–42	5 7	4 7
1942–43	5 5	5 5
1943–44	5 4	4 5
1944–45	6 4	4 9
1945–46	6 6	4 8

Lucerne meal.—The price of lucerne meal was fixed at 8s. 9d. per 100 lb. for meal derived from baled lucerne, and 8s. 3d. for meal from loose lucerne. This price may be increased by 6d. per 100 lb. for handling costs plus 1d. per mile (with a maximum of 9d.) per 100 lb. for motor delivery.

Oat hay.—On 11 January 1946, the price for oat hay was fixed as follows:—Dry, 4s. 6d. per 100 lb. unbaled and 5s. 3d. baled, plus 9d. handling costs and railage and 1d. per mile for motor delivery. The prices for fodder oats were fixed at 7s. 6d., 6s. 6d. and 2s. 6d. per 100 lb. for 1st, 2nd and low grades respectively. These prices may be increased by the cost of the bag, railage and 1s. handling costs, plus 1½d. per month after 1 April 1946.

Potatoes.

Production was considerably extended during the past year up to August 1946. Nevertheless, the Food Controller had to resort to controlling supplies and provisions for about four weeks from 26 October to 26 November 1945 in order to ensure equitable distribution.

Crop estimates are given below, togther with the annual weighted average prices on the Johannesburg market.

Year.	Crop Estimate.	Weighted Average Prices.
	Bags.	Per Bag. s. d.
1938–39	2,893,000	6 7
1939–40	2,266,000	6 7
1940–41	2,522,000	13 10
1941–42	2,426,000	19 0
1942–43	2,941,000	13 3
1943–44	2,155,000	16 4
1944–45	2,600,000	22 1
1945–46	2,865,000	28 10

Price Determinations.

As a result of the compulsory grading of potatoes on the nine main markets, a price was fixed during July 1945 for each individual grade according to the stage in the movement from producer to consumer. On 17 August 1945, price increases of 3s. to 3s. 6d. per bag for the good qualities, and 2s. for third grade potatoes were

announced, these prices being again modified in September to provide for sales by market masters. Although market prices declined, these high fixed prices were maintained until March 1946, when fixed prices were reduced to the level noted for July 1945. The increasing shortage of good potatoes led to the re-introduction of the high price level as from 16 August 1946. At the close of the departmental year the following fixed prices were in force:

Potatoes.	1st Grade.		2nd Grade.	3rd Grade.	Under-grade.
Sales.	Classed.	Unclassed.			
	s. d.	s. d.	s. d.	s. d.	s. d.
Producer: Dealer..........	34 6	33 6	27 6	22 6	15 0
Producer: By Auction......	35 3	34 3	28 3	22 9	
Producer: Market master....	37 9	36 9	30 0	24 3	
Producr: Consumer..........	38 6	38 0	31 6	26 0	
For quantities less than 150 lb. to consumers............	10d. per 3 lb.	10d. per 3 lb.	11d per 4 lb.	7d. per 3 lb.	

Seed potatoes, which were scarce during the war years, have become fairly plentiful again and to all appearances crops will in future be adequate to meet the domestic demand at reasonable prices.

Vegetables.

Vegetable production developed tremendously from 1939 up to the end of 1945, as is reflected by the sales of seven items (onions, sweet potatoes, tomatoes, green beans, green peas, cabbage and cauliflower) on eight municipal markets in the Union.

Sales of seven vegetable items on eight municipal markets.

Year.	Tons.
1939	79,593
1940	81,118
1941	89,539
1942	105,917
1943	106,148
1944	127,083
1945	133,497

Vegetable prices generally also showed a sharp upward tendency over the period.

TABLE XXIV.—*Weighted average prices for seven vegetable items on the Johannesburg market* 1939-40—1945-46.

Vegetable.	1939–40.	1940–41.	1941–42.	1942–43.	1943–44.	1944–45.	1945–46.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d
Onions (Cape), bag....	9 10	12 3	13 11	14 0	18 9	18 5	14 11
Sweet Potatoes, bag...	5 7	7 3	9 10	9 8	12 0	17 3	14 11
Cabbage, bag.........	3 5	5 10	8 10	5 6	11 1	9 7	10 1
Cauliflower, bag......	3 0	3 11	5 9	5 0	9 2	7 5	8 4
Green beans, pocket...	1 8	1 11	2 7	3 1	3 8	3 7	3 4
Green peas, pocket....	2 4	2 8	3 11	3 3	4 11	4 9	5 11
Tomatoes, N.M. Gr. I, box..............	2 1	2 7	3 1	3 4	5 5	4 1	4 11

Throughout the war there was such a heavy demand for vegetables that the supply seldom exceeded it to any appreciable

extent, and was frequently unable to meet it. During the winter of 1946 there were, however, signs of glutting on the Cape Town market, as a result of the exceptionally favourable season, which led to a considerable decline in prices.

Tobacco.

The world shortage of tobacco caused an enormous rise in prices. In the case of Southern Rhodesia the past season's crop of 41·5 million lb., sold by public auction, yielded a total of £5,600,000 which averages 31·25d. per lb.

The Union's crop for 1945-46 was considerably larger than that of the previous year, and the present crop is estimated at 5 per cent. higher than that of 1945-46, despite the decline in the figures for Turkish tobacco. The figures for the years 1938-39—1946-47 in respect of the various classes of tobacco are as follows:—

TABLE XXV.—*Tobacco crops in the Union from* 1939-40 *to* 1946-47.

Crop Year.	Turkish.	Virginian.		Total.
		Flue-cured.	Air-cured.	
	lb.	lb.	lb.	lb.
1939–40	835,549	5,774,290	17,627,177	24,237,016
1940–41	328,654	13,080,166	25,538,973	38,947,793
1941–42	485,192	8,362,211	14,172,145	23,019,548
1942–43	596,230	9,459,848	14,409,861	24,465,939
1943–44	406,195	10,522,199	21,136,900	32,065,294
1944–45	532,823	8,508,020	15,357,669	24,398,512
1945–46	786,089	13,773,760	18,034,491	32,594,340
1946–47*	550,000	15,715,000	17,984,000	34,249,000

* Estimated.

The extent of tobacco consumption can be deduced from the quantity manufactured. During the calendar year of 1945 more than 33 million pounds were manufactured—an increase of 300,000 pounds, compared with the previous year. The increase is distributed over all classes of tobacco, as is clearly shown by the following figures:—

TABLE XXVI.—*Manufacture of Tobacco* 1938-1945.

Calendar Year.	Turkish.	Flue-cured.	Air-cured.		Total All Classes.
			Light.	Dark.	
	lb.	lb.	lb.	lb.	lb.
1938	770,000	6,219,000	6,679,000	9,141,000	22,809,000
1939	752,000	7,441,000	6,208,000	9,383,000	23,784,000
1940	864,000	8,922,000	5,603,000	9,663,000	25,052,000
1941	760,000	11,251,000	6,253,000	10,527,000	28,791,000
1942	624,000	12,105,000	7,854,000	9,416,000	29,999,000
1943	633,000	13,955,000	7,702,000	8,000,000	30,290,000
1944	551,000	15,443,000	6,798,000	7,294,000	30,086,000
1945	628,000	17,376,000	7,527,000	7,530,000	33,061,000

TABLE XXVII.—*Union Imports of Tobacco* (1938-1945.)

Calendar Year.	Turkish.	Virginian.		Total All Classes.
		Flue-cured.	Air-cured.	
	lb.	lb.	lb.	lb.
1938	194,854	2,789,060	235,052	3,218,966
1939	2,481	3,443,218	206,718	3,652,417
1940	2,487	1,911,782	448,858	2,363,127
1941	573	1,548,004	381,036	1,929,613
1942	—	4,035,456	352,906	4,388,362
1943	—	5,818,403	540,915	6,359,318
1944	—	10,802,997	310,175	11,113,172
1945	—	1,350,726	367,643	1,718,369

Over the seven-year period, an annual average of 4½ million lb. was imported. Under agreements, a total of 400,000 lb. of tobacco is annually imported duty-free from Northern Rhodesia. Admissions from Southern Rhodesia were determined as follows:—

Duty-free Admissions from Southern Rhodesia.

Year.	*Quantity.*
	lb.
1936–37	2,006,000
1937–38	3,188,000
1938–39	2,000,000
1939–40	3,000,000
1940–41	1,000,000
1941–42	3,000,000
1942–43	2,000,000
1943–44	4,500,000
1944–45	10,000,000
1945–46	1,500,000
1946–47	3,000,000

Owing to the shortage in the Union, especially as far as light-leafed varieties are concerned, these imports as well as the Union's own production are still subject to allocation between manufacturers. A start was also made this year with the allocation of duty-free imports from Northern Rhodesia.

The average crop for the seven years up to 1945-46 is 28·53 million lb. Against this, the consumption averaged 28·72 million lb. over the same period. An annual average of 4·50 million lb. was imported, and although this should have led to an accumulation of supplies, this is not found to be the case.

Virginian types only were exported during 1945-46, i.e. 259,217 lb. on which an amount of £3,390 was paid out in premiums by the Tobacco Board. Exports were largely restricted to Sweden, viz. 236,417 lb. in 1946.

The Union's crop is handled by 10 co-operative organizations at various centres in the country, while 112 manufacturers and wholesalers have undertaken the distribution.

With the approval of the Minister, the Board has raised prices by 10 per cent. i.e. as far as the producer is concerned prices are now the basic price plus 55 per cent. The basic price is based on the level of producer's prices for the various grades of tobacco in 1939.

Chicory.

The demand for this product doubled itself during the war period. High prices for coffee and the shortage of tea probably also

contributed to this development. Inadequate production in the Union and the import difficulties made rationing inevitable. Since no seed had previously been grown locally and owing to the difficulty experienced in obtaining seed, production could not be expanded and the shortage of roots continued. Attempts are at present being made to increase production to meet trade requirements and at the same time to abolish the existing system of rationing the trade.

TABLE XXVIII.—*Production since the Establishment of the Chicory Industry Control Board.*

Year.	Production.	Prices per 100 pounds.		
		First Grade.	Second Grade.	Third. Grade.
	lb.	s. d.	s. d.	s. d.
1945–46	5,267,000	35 0	30 0	25 0
1944–45	6,301,000	35 0	30 0	25 0
1943–44	6,623,000	32 0	30 0	27 0
1942–43	5,324,000	32 0	30 0	27 0
1941–42	4,918,000	29 0	27 0	24 0
1940–41	6,923,000	26 0	24 0	21 0

As can be seen from the above prices, it was the policy of the Board to keep prices as low as possible. Price determinations according to grade were gradually increased to 35s., 30s. and 25s. per 100 lb. for the three grades for the year under review. The price of first-grade chicory will be raised from 35s. to 36s. for the following year. The levies payable by producers were maintained at 2s., 1s. 6d. and 1s. 3d. per 100 lb. for the respective grades.

Contracts have now been concluded overseas for sufficient seed to double production.

The Board at an early stage secured an adequate supply of bags for the marketing of the crop for several years to come.

The Board has also taken steps to provide manufacturers with an improved product, and is undertaking dehydration experiments with the fresh root. Further developments are being awaited.

Oil Seeds.

The Union's low production makes the country dependant on imports, and consequently the shortage of fats in Europe, especially vegetable fats, has detrimentally affected supplies to the Union, with the result that here, too, serious shortages developed. The allocation to the Union of only a small portion of the country's requirements from available world supplies, seriously affected both our oil and our feed position. It is now imperative that the country should, at least for the present, become self-supporting.

Plans for an increased production have been drawn up and efforts are being made to encourage the planting especially of groundnuts and soybeans. Seed is being made available for this purpose.

Ground Nuts.

The past year's crop was estimated at 240,000 bags which, although still low, showed a gratifying improvement on that of the previous year.

Owing to the shortage of oil seeds in general, the demand for this product is enormous and prices are tending towards higher levels. Maximum prices have again been introduced although on a higher basis.

The producers' price at present is 35s. per 100 lb. unshelled with a minimum kernel content of 60 per cent., and 55s. per 100 lb. shelled. Seed prices have been raised to 120s. per 200 lb.

As the shortage of oil seeds became more acute, the danger of black marketing increased and it was decided to place the existing supplies under the control of the Controller of Food Supplies. At present all sales are regulated by this organization.

The Groundnut Advisory Committee, which was dissolved during 1944, was recently re-established on a modified basis designed to extend representation to the new producing areas.

Production and prices of groundnuts during the past few years were as follows:—

Year.	Production (100 lb. bags).	Prices per 100 lb. (60 per cent. kernel content).
		s. d.
1937–38	213,000	10 0
1938–39	298,000	11 2
1939–40	213,000	10 9
1940–41	172,000	12 1
1941–42	122,000	20 0
1942–43	256,000	21 0
1943–44	243,000	25 0
1944–45	142,000	28 3
1945–46	250,000	35 0

Citrus Fruit.

Table XXIX shows the production, in 65 lb. boxes, of citrus fruit in the Union for the years 1940 to 1945, as well as the quantities exported over the same period:

Table XXIX.—*Production and Export of Citrus Fruit*, 1940-1945:—

Year.	Production.	Export.
	Boxes.	Boxes.
1940	6,500,000	3,864,000
1941	6,900,000	2,049,000
1942	7,100,000	2,303,000
1943	7,250,000	1,247,000
1944	7,600,000	985,000
1945	6,600,000	2,757,000

Despite increased production during the war and the diminished export, the Citrus Board succeeded in disposing locally of a steadily increasing volume of citrus fruit.

The crop for 1946 was detrimentally affected by drought and is estimated at 3,278,000 boxes of export quality, of which 1,370,336

boxes were exported up to the end of August, 1946. Up to the middle of August, 1946, about 2,800,000 pockets of citrus fruit were sold in the Union from an estimated total of about 6 million pockets for the Union market.

This is approximately one million bags less than the corresponding figures for 1945.

The even distribution of citrus in the Union was capably managed by the Board, and the establishment of citrus sales depots in certain cities led to increased consumption and lowered distribution costs.

The receipts from local sales as well as from exports of citrus were pooled and paid out to growers after deduction of expenses.

Citrus fruit was exported to England at agreed prices fixed from time to time. Since 1943 local maximum prices have been fixed by the Price Controller. The citrus pool payments per box were as follows:—

	s.	d.
1940	4	0
1941	3	5
1942	4	3
1943	2	7
1944	2	3
1945	7	1·97

The comparatively low payments made during 1943 and 1944 were due to the relatively small export, as a result of which a larger percentage of the crop had to be sold at the lower local prices. The payments during these two years were, however, raised by subsidy to 3s. 5d. per box for smaller producers.

Deciduous Fruit.

The deciduous fruit industry was even more seriously affected by the war than the citrus industry, since all export to England was suspended as from 1940.

The industry was, therefore, virtually restricted to the local market. Whereas during 1938 and 1939 an average of 35,813 tons of fresh fruit was still exported, the export of the 1940-41 season amounted to only 21 tons.

Owing to the suspension of exports, the Deciduous Fruit Board was authorised to take over the normally exportable fruit crop and dispose of it locally. The Board therefore had to find a market for the deciduous fruit crop, which was steadily increasing as can be seen from the following figures.

Quantities of Deciduous Fruit handled by the Deciduous Fruit Board.

Year.	*Tons.*
1940–41	31,803
1941–42	44,155
1942–43	46,995
1943–44	66,978
1944–45	64,260
1945–46	54,437*

* Represents peaches, plums, pears and grapes.

In pursuance of the recommendations of a commission appointed to investigate matters relating to the deciduous fruit industry, the Deciduous Fruit Board was given full control over the marketing of plums and pears as from 1941-42, and subsequently of peaches and grapes.

As a result of the loss of the profitable overseas market, the Government made an annual contribution averaging £275,000 during the period 1940-41 to 1945-46 for the support of the deciduous fruit industry.

In addition, loans were granted to farmers through the Board, to finance production and the purchase of packing material.

In general, prices paid to producers for fruit received by the Board show a rising tendency over the six years 1940-41 to 1945-46, as is shown in Table XXX.

TABLE XXX.—*Average prices to farmers for fruit received by the Deciduous Fruit Board.*

	1940–41.	1941–42.	1942–43.	1943–44.	1944–45.	1945–46.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Plums: Bulk, Gr. 1, per ton......	8 6 8	9 7 6	—	10 5 0	14 0 0	14 0 0
Peaches: Single-layer tray, Gr. I	0 1 9	0 2 0	0 2 6	0 2 6	0 3 0	0 3 0
Pears: Per box, Gr. I..........	0 6 8	0 6 10	0 7 5	0 8 3	0 10 5	0 10 6
Grapes: Nett (packing excluded), Gr. II, per ton..	12 10 0	14 11 8	20 16 8	17 14 2	18 15 0	20 16 8

Dried Fruit.

Total production figures for the past nine years (1937-1945) were as follows:—

	lb.
1937	28,858,842
1938	26,015,636
1939	26,553,252
1940	32,875,276
1941	25,489,523
1942	37,657,175
1943	36,440,099
1944	36,973,781
1945	34,783,786

During the 1946 season approximately 15,500 tons of dried fruit were produced as against 17,400 tons in 1945. Sultanas were considerably lower (2,004 tons as against 3,400 tons in 1945) and apricots only approximately 150 tons as against 680 tons in 1945. The total production of tree fruit was approximately 3,400 tons as against 4,435 tons in 1945. In comparison with 1944, therefore, this year's dried tree-fruit yield showed a decrease of almost 1,800 tons. This large decrease was due mainly to the increased demand for fresh fruit for canning purposes and to the failure of the apricot crop.

Owing to this decrease in production and the expected suspension of the Export Regulations, packers endeavoured to take in as much fruit as possible. Consequently only 1,000 tons of raisins could be exported this year. The production of peaches was hopelessly inadequate and the same applies to apricots. Packers hope to be able to import about 900 tons of prunes.

Pools were again established in respect of raisins, sultanas, currants and apricots (fresh as well as dried) and agents had to take in all these dried fruits on behalf of the Dried Fruit Board. There were no export losses, except on raisins, and on the whole, prices to producers were therefore slightly higher than in 1945, which was itself a record year. No pool deficits are expected this year.

Since 1944, prices were determined for all types of dried fruits, with the exception of specially dried vine fruits. This work is being continued as far as possible. The Board expects to take full control again and negotiations are at present conducted with the National Marketing Council in order to stabilize control over dried

fruit and to control dried fruit under the regulations of the Marketing Act instead of under war measures as has been the case up to the present. Prices paid by the various pools were as follows:—

TABLE XXXI.—*Pool prices for sultanas, raisins and apricots in pence per pound.* 1939-40—1944-45.

Year.	Sultanas.	Raisins.	Apricots.
	(Per lb.) d.	(Per lb.) d.	Per lb.) d.
1939–40	2·25	2·00	6·75
1940–41	2·25	2·39	6·75
1941–42	3·14	2·93	9·50
1942–43	3·24	5·11	9·51
1943–44	3·50	3·38	11·52
1944–45	3·74	4·54	10·24

The existing grading regulations were revised and published during the year. Various further amendments are required, however, and the matter is receiving the attention of interested parties. The aim is, by means of price manipulations for the different grades, to encourage producers to market a better product.

Viticulture.

The total annual vine crop for the past seven years is given in Table XXXII which also reflects the crop in terms of leaguers used for making distilling wine, good wine including wine for the farmer's own use, and for raisins and sultanas.

TABLE XXXII.—*Total Vine Crop* 1939-1945.

Year.	Crop in terms of Leaguers of 20 Per Cent. Proof.	Distilling Wine.	Good Wine.	Raisins and Sultanas.
1939	290,308	187,091	82,258	20,959
1940	326,053	223,047	86,129	16,877
1941	396,711	151,684	196,388	48,639
1942	435,736	187,834	192,675	55,227
1943	440,788	243,347	143,682	53,759
1944	509,792	287,315	165,030	57,447
1945	469,716	305,310	107,452	56,954

The following prices were paid to farmers for wine per leaguer:—

Year.	1941.	1942.	1943.	1944.	1945.	1946.
	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
Distilling Wine....	4 2 6	4 14 4	5 12 6	5 10 4	5 16 5	5 16 5
Good Wine........	6 0 0	6 5 0	7 0 0	7 0 0	7 10 0	8 0 0
Quality Wine......	10 0 0	10 5 0	11 0 0	11 0 0	11 10 0	12 0 0

Inland Marketing.

Intelligence Service.—As in the past, market reports consisting of market prices and a review of marketing conditions were furnished to the press, the radio and interested persons and business concerns.

As from February 1946, a daily instead of a weekly market bulletin for housewives has been furnished to the radio and to the press.

Since 17 June 1946, a general view of supplies and average prices on the 9 major markets of the Union is given over the radio. Producers therefore receive daily information in regard to comparative prices on the various markets.

With the resumption of wool auctions, weekly wool reports have been given to the radio and the press as before the interruption caused by the war.

The National Mark Scheme.—Registrations of producers under this scheme are steadily increasing.

In the case of tomatoes there were no fewer than 203 new registrations consisting mainly of farmers in the neighbourhood of the Rand where tomato production is steadily increasing. Considerable increases also occurred in the case of green beans and green peas, with 98 and 81 registrations respectively.

As a result of the introduction of the compulsory grading schemes in respect of citrus fruit, deciduous fruit, potatoes, eggs and meat, the National Mark was discontinued in these cases.

Interest in registration is a heartening sign since it is an indication that producers are realizing more and more the advantages of grading, especially when production is high.

The following figures show the increase in offerings under the National Mark for certain products on the Johannesburg market since 1937-38:—

	1937–38.	1945–46.
Tomatoes (boxes)	246,549	1,044,946
Papaws (standard boxes)	53,964	86,834
Strawberries (punnets)	360	44,350
Dressed poultry (head)	26,851	110,432

The fact that producers are at present better informed in regard to grading than some years ago, is reflected in the following figures from the Johannesburg market:—

Percentage approved, of the quantity offered under the National Mark Scheme:—

	1942–43.	1945–46.
Tomatoes	87·3	91·4
Papaws	86·6	91·7
Avocados	87·3	99·6

Compulsory Grading.—The following schemes were again applied by the branch offices.

1. Compulsory grading scheme for citrus fruit.
2. ,, ,, ,, ,, deciduous fruit.
3. ,, ,, ,, ,, potatoes.
4. ,, ,, ,, ,, eggs.
5. ,, ,, ,, ,, meat.

The following figures give an indication of the extent of the work in connection with the schemes:—

	Quantities Inspected (Johannesburg only). 1945–46.
Potatoes	788,063 bags.
Grapes	401,460 half lug-boxes.
Apples	129,386 trays.
Oranges	1,156,779 pockets.
Eggs	1,748,640 dozen.
Sheep and lambs	639,672 carcases.

Apart from meat grading which has now been carried out at the Rand abattoirs for several years a more or less regular inspection service has been introduced on all east and west Rand markets for deciduous fruit, potatoes and eggs. East and west Rand towns have not as yet been proclaimed controlled areas for citrus fruit. Inspection on the east and west Rand markets consisted mainly of test inspections, since the majority of the market-masters made available a staff member to help with the inspection under the guidance of the inspector of the Division.

In order to ensure compliance with the regulations by retailers, the latter are visited regularly and prosecutions instituted where necessary. In Johannesburg alone, about 1,000 such visits were carried out during the past year, and 25 per cent. of these resulted in prosecutions (Rand towns included). During the past year, courts have been regarding violations of this type in a serious light and have imposed more severe penalties.

Extension work in connection with grading and packing could be undertaken on a larger scale among producers not too far removed from the branch offices. In the case of potatoes, where compulsory grading had been in force for only a year, a considerable amount of extension work was undertaken. In addition, useful information was also gained on these extension tours, in regard to crops, general conditions, etc.

Food control.—During the year, the branch offices were still responsible for extensive activities on behalf of the Food Control Organization, such as the buying and handling of eggs, potatoes and other vegetables.

The distribution scheme was further extended and in addition to the existing depots at Pretoria and Cape Town, new depots were opened at Port Elizabeth, Kimberley, East London, Durban, Bloemfontein and Pietermaritzburg.

All the officers in charge of branch offices are now members of the Regional Food Committees appointed in their areas.

General Activities.

The activities of the Division were seriously hampered during the war years. Scientific research, with the exception of a few cost investigations, was practically brought to a standstill.

Although the general policy during the war was to continue only with the most essential research work, the staff position gradually deteriorated to such an extent that urgent investigations of a special nature could hardly be carried out in time.

As an indication of the staff position, it may be mentioned that since 1939 the Division lost the services of 17 members of the professional staff.

A number of the professional officers were also seconded to other Government Organizations.

After having been suspended during the war, bursaries for overseas study were again made available during the past year, and of the newly appointed staff members, of whom six junior professionals are still with the Division, 3 went overseas this year for further study.

During November, 1945, the Division lost the valuable services of both its chief, Dr. J.F.W. Grosskopf who retired, and its Assistant Chief, Mr. J. I. Raats, who was appointed Director of Census and Statistics. They were succeeded by members of the Division, Messrs. S. J. J. de Swardt and C. H. Spamer respectively.

The domestic marketing service was considerably extended during the war and shouldered more and more duties. The service, which

was originally only of a temporary nature, became permanent in 1942 and it is expected that the few temporary posts still attached to this service will be made permanent in the near future. Difficulties are however, still being experienced in retaining the necessary trained personnel, especially for grading duties, as at present in the case of meat.

As mentioned before, research work undertaken during the war was mainly of a specialized nature and was carried out under special instructions, as for example: Cost investigation in connection with potato production, 1942-43; dairy production in the western and eastern Cape Province, East Griqualand, eastern Orange Free State, eastern Transvaal, Natal and the north-western Cape Province in 1943-44 and 1944-45; egg production by specialist poultry farmers in Natal, Transvaal and the western Cape Province, in 1944-45; and vegetable production under the Bon-Accord scheme in 1944-45.

With the return, however, after the cessation of hostilities, of officers who had been seconded to other departments, the Division resumed its investigational duties and, although the staff shortage remained serious, an energetic programme was undertaken during the past year.

During the past year, too, the Division resumed the classification of the country into agro-economic areas, which had been suspended during the war.

The field work in respect of the western Orange Free State, Western Transvaal, the Kalahari and the bushveld areas of the Transvaal has been completed. Reports in regard to 20 agro-economic areas have also been completed, and the majority are ready for publication.

Towards the middle of 1946 an Advisory Agro-economic Regional Committee was constituted on which the Divisions of Economics and Markets, Soil Conservation and Extension, Agricultural Education and Research, Botany and Plant Pathology and Chemical Services were represented. The Agricultural Research Institute, which is attached to the University of Pretoria, was co-opted for work in connection with the summer-rainfall area, and the Stellenbosch-Elsenburg College of Agriculture for work in connection with the winter-rainfall area. This committee forms a useful link between the various Departmental bodies, with a view to ensuring the necessary co-ordination between the different co-operators taking part in this important work.

During the year a farm-bookkeeping and costing project was approved and introduced by the Division. The purposes of this project are *inter alia*, to obtain reliable production and cost data from a number of representative farmers in each of the most important agricultural areas, which may serve to supplement and check information gathered through field surveys for research purposes. Under the project, farmer co-operators are assisted by professional officers of this Division in keeping and completing the various account forms. The project is also connected with the demonstration farms of the Division of Soil Conservation and Extension. Up to the present, the project has been put in operation on the Transvaal Highveld for dairy and mixed farming; in the western Cape Province for viticulture and fruit culture, and in East Griqualand for dairy farming.

During the year a country wide farm labour investigation was commenced, with special reference to the economic and social aspects of farm labour. The field work in the winter-rainfall area has been completed and the data are at present being elaborated.

The revision of the various price index series kept by the Department, was also commenced and this work is being continued.

Chemical Services for the State.

J. P. van Zyl, B.A., Ph.D., Chief of the Division of Chemical Services.

THE work of the Division during the year was greatly influenced by two factors, namely, (*a*) staff difficulties, and (*b*) increased demands for services by various Departments and institutions. These two factors work in opposite directions and have made the position very difficult. This Division, however, is not the only one in this position.

Regulatory Work.

1. Pretoria.

The work of the Pretoria Laboratory may be roughly divided into three main groups, namely, (*a*) soil survey, (*b*) soil fertility, and (*c*) general and industrial.

(*a*) *The Soil Survey Group* was fully occupied in rendering services to various bodies. The following is a summary of the work undertaken during the past year by this Section:—

(i) The survey of the Crocodile-Thabazimbi Irrigation Project was completed for the Irrigation Department by the end of 1945.

(ii) The Bospoort-Scheme at Rustenburg was surveyed for the Irrigation Department with a view to its extention.

(iii) Since April 1946, three soil survey parties have been engaged in an investigation of the Orange-Fish-Sundays Rivers Project, with its possible extensions. This undertaking for the Irrigation Department will last several years.

(iv) The intensive survey of the Loskop Scheme was completed in September 1945 for the Lands Department.

(v) In connection with soil reclamation, assistance was rendered to the Departments of Lands and Irrigation with regard to brak and water-logging on various irrigation schemes.

(vi) The survey of the Rooikraal Settlement, Middelburg, was completed for the Lands Department by the end of 1945.

(vii) Services were rendered to the Native Affairs Department in connection with the rehabilitation of native areas in the Ciskei and Transkei and in the Transvaal.

(viii) The Hellenic College Farm, Rooikraal, Heidelberg, was surveyed at the request of the Division of Soil Conservation and Extension.

(ix) An officer of this Division co-operated in carrying out an agro-economic survey of the western Orange Free State, Bechuanaland and Northern Transvaal for the Division of Economics and Markets.

(x) At the request of the Resident Commissioner of the Bechuanaland Protectorate, a visit was made to that region to advise on irrigation schemes and soil reclamation.

(xi) Professional assistance was given to the East London Municipality in a case before the Water Court, and to the South African Railways and Harbours Administration in connection with the expropriation of property.

(xii) Requests for the services of the soil survey section were made in connection with Regional and Town Planning Schemes.

(*b*) *The Soil Fertility Section* is greatly hampered by the lack of a suitable pot-house, by resignations of staff, and by the fact that the colleges of agriculture are hardly in a position to undertake any extra work. However, advisory work on soils from farmers and small-plot holders based on rapid methods of analysis, was continued and about 50 to 100 samples of soil were examined per month.

(*c*) *The General Section* covers a wide field of work. Insecticides and weedkillers are receiving considerable attention, and much work has been done on emulsions and emulsifying agents.

Analyses of water were carried out for the Industrial Development Corporation, for the farming community for irrigation purposes, and for the Irrigation Department. Assistance and advice were also rendered to industries on water supplies and requirements and on industrial effluents. For irrigation purposes alone, about 420 samples of water were analysed, whilst 200 samples of manures, composts and fertilizers were analysed during the year, in addition to the analysis of grasses, fodder and soils undertaken for various research stations and for co-operative experimental work.

Analysis of rocks and minerals were carried out for (*a*) the geological survey, (*b*) the public, (*c*) the universities, through the Council for Scientific and Industrial Research, and (*d*) export purposes for the Department of Mines. The work under (*c*) was undertaken to assist the research efforts of the university staffs. For these purposes altogether 300 samples were analysed.

Work on percussion-cap compositions, metals and alloys, etc., was carried out for the Department of Defence.

In addition, a large amount of advisory work was carried out for various bodies and institutions, such as the Department of Defence, the Divisions of Veterinary Services, Entomology, Horticulture and the Research experiment stations. Much time was devoted to the work of drawing up standards of various products such as D.D.T., paper, oils, etc., in co-operation with the Bureau of Standards.

The staff of the Government Printing Works Chemical Laboratory has had to be augmented owing to the considerable increase in the volume of work.

2. Johannesburg and Cape Town.

The normal work of the Johannesburg and Cape Town laboratories is similar in nature and consists mainly of regulatory work under various acts such as the Foods, Drugs and Disinfectants Act; Wine, Spirits and Vinegar Act; Agricultural Export Act; Fertilizers, Farm Foods and Pest Remedies Act, as well as work for the Departments of Customs and Excise, Justice, Public Health, and Mines and general work for the Public Works Department, the Provincial Administration and other institutions.

During the year 6,500 samples were analysed in the Johannesburg Laboratory, of which 2,630 were examined under Act 13 of 1929. Some 195 samples, mostly milk, failed to comply with the regulations under this Act. Under Act 15 of 1913, 450 samples were analysed, and 89 were found to fail, whilst 840 samples were examined for Customs purposes and 801 exhibits analysed for the Department of Justice. In both these cases there was a rapid increase in the work, involving a heavy burden on a depleted staff. The tariff value of the work done was about £20,000.

In the Cape Town Laboratory the distribution of the work differs somewhat from that in Johannesburg, and the major portion of the work consists of the examination of wines and spirits under Act No. 35 of 1917. During the year 13,000 such samples were examined, representing 6,500 shipments of wines and spirits. This work provides about 85 per cent. of the work in the Cape Town Laboratory at the moment. The samples analysed under Act 13 of 1929 numbered 1,190 of which 135 failed to comply with the regulations. Of the failures, 121 were milks. Some 506 samples were examined for Customs purposes, and 75 samples of imported wines and spirits. In addition, 103 gallons of Chaulmoogra esters were prepared for use by the Public Health Department in the treatment of leprosy. The tariff value of the work done in the Cape Town Laboratory was about £29,850 of which £25,170 was in respect of wines and spirits under the Agricultural Export Act.

Investigation.

Owing to the unsettled conditions it has not been possible to carry out any long-term research work and, with a shortage of staff, only immediate problems can be tackled. This is specially the case with the advisory work which occupies so much time in the Pretoria Laboratory.

The development of suitable thermal smoke generators for producing D.D.T. and other insecticidal and fungicidal smokes for general use proved successful, but the mixtures initially suggested had to be modified to overcome the dangers attached to their manufacture. The costs and efficiency of the various methods of smoke generation are being worked out. This work was carried out mainly in connection with the campaign against tsetse fly, since such generators can be used where aircraft are impracticable, but it will be extended to include other insect pests such as white ants, etc.

Investigations on organic insecticides and weedkillers are being continued and various compounds have been prepared for experimental testing. This work is being carried out in co-operation with other Divisions.

Work in connection with the dehydration of chicory has been virtually completed, a pilot plant having been operated successfully; but work is proceeding on roasting tests of the fine material remaining after the production of the dried cubes. This work was carried out in co-operation with officers of the Dehydration and Cold Storage Laboratory.

Large numbers of samples of lucerne, wheat, maize, etc., from established fertilizer trails throughout the country are being analysed to determine the quality of the products grown under different fertilizer treatments. In these experiments stress is laid upon the nutritional quality of the product rather than purely on quantity, and

valuable information is being collected. In this respect about 350 samples of wheat and lucerne were examined for the phosphate, potash and nitrogen content.

A long-term rotation on the best method of soil utilization, with chicory as a cash-crop in various rotations, was designed and established in conjunction with the Pature Research Officer at Alexandria. The fertilizer experiments conducted at Vaal-Hartz with assistance of this Section are yielding valuable results. During the year considerable progress was made with the working up of data preparatory to the compilation of a comprehensive report.

Research work on marking-fluids used for meat and for marking sheep has recently been revived.

Work has been commenced on means for assessing the freshness or otherwise of meat and fish products, since there is evidence that unsound meat or fish may be used in their manufacture, and an investigation has been started into the chemical changes taking place in bottled wines during storage. Attempts are being made to shorten the time required for the determination of arsenic in export fruit.

Publications.

During the past year 5 radio talks were provided by officers of the Division, all on fertilizers and soils. The calls made upon the staff to act in an advisory capacity render it extremely difficult to devote time to this essential function, and printing difficulties have held up the publication of pamphlets. The following publication was issued as a reprint:—

"The Copper and Lead Content of Human Tissues."

The following are in course of publication or ready for publication:—

"Determination of Copper and Lead in Biological Material."

"Determination of Arsenic in Contaminated Soils."

"A Study of Some Chemical Changes occurring during the Dehydration of Vegetables."

"The Production of Nicotine Sulphate from Waste Tobacco."

Dairy Production in the Union.

L. J. Veenstra, Superintendent of Dairying.

THE year, September 1945 to August 1946, was in several respects, for all the branches of the Dairy Industry in the Union, a difficult one.

A very serious drought was experienced during the spring and early summer of 1945; production fell to an unusually low level in the last quarter of the calendar year 1945 and it was well past the New Year before any improvement in this respect took place. It can rightly be said that the position was most critical in December, 1945, and early in January, 1946, when many parts of the country were in such a state that cattle farmers were beginning to despair of being able to produce sufficient food for their animals for the coming winter.

But, as has often occurred in previous years, good rains fell at the very last moment and still in time to allow of a fair growth of natural veld, which lasted well into the winter months.

The production of dairy products was therefore surprisingly good towards the end of the summer and during the autumn and early winter months of 1946, especially in those areas where the production is chiefly " off the veld ".

The unfavourable climatic conditions experienced during a considerable part of the year were no doubt the main cause of the lowest total annual production of butter and cheese in the Union for several years.

An important contributory cause was the fact that concentrates were not obtainable in sufficient quantities. There was a very serious shortage of protein feeds and mealies, and as suitable substitutes were available only in very limited quantities, it will readily be understood that the dairy farmer, who depends to a large extent on the cattle feed he can purchase, had a most difficult and worrying time.

A third factor which greatly influenced the production of milk was the serious outbreak of " lumpy skin " disease, previously quite or almost unknown in the Union. This scourge suddenly made its appearance in the Transvaal during 1945 and, in a few months' time, had spread over very large areas, affecting a great number of herds in the Transvaal, Orange Free State and northern Natal.

Although the death rate among cows was light, the loss of milk was very considerable in all cases where the cows contracted the disease during the lactation period, and since many thousands of milk cows contracted " lumpy skin ", the loss in milk over the whole country must have been tremendous. In the circumstances therefore, it is not surprising that the total production of milk fell very much short of the country's requirements.

The demand from the large urban centres for fresh milk has been steadily increasing, notwithstanding the fact that the retail price is considerably above that of pre-war days.

It would appear that our people generally are beginning to realize the importance of fresh milk as a food and that the consumption per capita is at present better than ever before.

To satisfy the demand for fresh milk, it was necessary to draw on the suppliers of industrial milk. In some cases producers who otherwise would have delivered their milk to cheese factories or

condenseries, took advantage of the opportunity to become city milk suppliers, but the bulk of the additional milk required by the fluid milk trade was supplied direct by several cheese factories.

A large number of cheese factories in different parts of the Union diverted all or an appreciable portion of their milk during the months of low production to the fresh milk trade.

The Witwatersrand requirements could not be met without a considerable quantity of milk from cheese factories in the Orange Free State, situated mostly along the Bloemfontein-Harrismith railway line, whilst Cape Town had to draw on the supplies intended for the production of cheese at Bonnievale, Ladismith and centres still further away. The position at Durban was probably even more difficult and very considerable quantities of milk had to be found in districts some 100 to 200 miles distant.

It is not surprising that under these circumstances the production of cheese was much reduced, especially in the areas known as our best cheese-making districts, viz. East Griqualand and the eastern Orange Free State.

The condensing industry was affected equally seriously by the increased demand for milk in the large centres. With a large amount of capital invested in this comparatively young branch of the dairy industry in the Union, it is necessary that a sufficiently large regular output of milk be maintained, but this was not possible in the circumstances. It is understood that some of the milk-powder and condensing plants had to work at no better than half capacity during several months of the year.

There was at no time any serious shortage of fresh milk in any of our large centres, although the distributors occasionally experienced difficulty in obtaining the necessary supplementary supplies to meet their requirements.

It is fortunate that many of our cheese factories are equipped with pasteurizing and cooling plants, a fact which makes it possible for milk to be railed over long distances and assures that it will arrive in good condition.

The pasteurization of milk for the fresh milk trade has become almost universal and it would seem that local authorities are moving in the direction of making pasteurization compulsory. There can be no doubt that this would be a step in the right direction.

Many small milk plants are likely to disappear as their turn-over would not be sufficiently large to warrant the installation of expensive equipment. This need not cause any hardship to those at present engaged in the distributive trade, as arrangements will no doubt be made to safeguard their interests.

Butter.

The butter position was very adversely affected by the serious drought suffered in South-West Africa where the production was the lowest for a number of years. The six creameries operating in S.W.A. together with two small creameries in the neighbouring territories, had a total production of 7,309,893 lb. as compared with 8,498,982 lb. for the corresponding period in 1944-45.

The total output of 47 registered creameries in the Union amounted to 33,775,006 lb., as against 38,793,681 lb. produced in the previous year.

Fortunately good stocks of butter were accumulated in cold storage prior to the 1946 winter when the quantity manufactured

dropped very materially. At the commencement of the winter there were 7,500,000 lb. of accumulated stocks.

From the following table it will be seen that there has been a considerable fluctuation in production over the past eight years:—

TABLE 1.—*Production of creamery butter in the Union and S.-W. Africa (including Bechuanaland and Swaziland Protectorates).*

Year.	Union.	South-West Africa, Bechuanaland Protectorate and Swaziland.
September–August—	lb.	lb.
1938–39	36,461,747	11,538,184
1939–40	44,472,786	12,109,165
1940–41	45,364,725	9,215,547
1941–42	39,701,035	7,493,154
1942–43	42,462,920	12,209,879
1943–44	43,320,431	11,644,990
1944–45	38,793,681	8,498,982
1945–46	33,775,006	7,309,893

Practically all our creamery butter is manufactured from pasteurized and effectively cooled cream so that its keeping qualities have been radically improved since the days when butter was manufactured from raw cream.

The butterfat delivered to the creameries registered in the Union can be classified as follows:—

First Grade ... ... 92 per cent.
Second Grade ... ... 7·2 per cent.
Third Grade ... ... 0·8 per cent.

These results are satisfactory and compare favourably with the percentages indicating the quantities of butter manufactured in the various grades, which are as follows:—

First Grade ... ... 91·3 per cent.
Second Grade ... ... 7·8 per cent.
Third Grade ... ... 0·9 per cent.

The average overrun or gain between butterfat churned and butter manufactured was 20·8 per cent., which is satisfactory and shows a very slight improvement on the figure for the previous year.

Although much of the time of the technical officers of the Division was taken up by grading duties, as required under the Dairy Products Marketing Scheme, it was nevertheless found possible to carry out a good deal of check testing of cream by taking samples of cream in transit from farm to factory.

It is the practice to have such samples taken and tested in duplicate to ensure that no error can possibly be made, and the official result as conveyed to the producer of the cream is therefore absolutely reliable. Minor differences between the official check tests and the creamery results must be expected, but from the evidence collected during last year and in previous years it is clear that, generally speaking, the suppliers have had little reason to suspect any malpractice on the part of the creameries in respect of the butterfat tests returned.

On the other hand, officers of the Division are convinced that some creameries have placed many a can of cream in a grade to which the cream was not rightly entitled. The practice of grading too leniently often results in the quality of the butter being reduced to the minimum required for the grade. But an even more dangerous effect is apparent in the case of some suppliers who do not accord due care and attention to their milk and cream and who only desire their cream to be paid for at the highest rate.

If creameries continue to grade too leniently, serious consequences must eventually result and suppliers and manufacturers can only expect to experience disappointment when it becomes necessary to enforce strict grading.

Under the Marketing Act all creamery butter must be graded before it is sold to the consumer. A total quantity of 33,364,152 lb. of creamery butter was graded by officers of this Division during the period under review. This total represented 29,873,828 lb. first grade, 3,130,149 lb. second grade and 360,176 lb. third grade, as presented by the creameries. Of the first grade 97·4 per cent. was passed as first, 2·4 per cent. was degraded to second and 0·2 per cent. to third grade. Of the second grade 96·8 per cent. was passed in the second grade and 3·2 per cent. was degraded to third grade. The third grade butter all passed in that grade. On the whole, these results are satisfactory.

The consumption of butter was 40,165,702 lb. for the period under review. Included in this quantity is a total of 257,220 lb. provided as ships' stores and exported to neighbouring territories, while 131,980 lb. of butter was imported.

TABLE II.—*Prices paid (per lb.) to suppliers for butterfat.*

Period.	Basic Price per lb.			Winter Premium.	Total Price to Supplier.		
	Grade 1.	Grade 2.	Grade 3.		Grade 1.	Grade 2.	Grade 3.
1945–46	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Sept. and October..	1 9	1 7	1 5	7	2 4	2 2	2 0
November to January 1946.......	1 11	1 9	1 7	4	2 3	2 1	1 11
February to May...	2 1	1 11	1 9	Nil	2 1	1 11	1 9
June.............	2 1	1 11	1 9	4	2 5	2 2	2 1
July to August.....	2 1	1 11	1 9	6	2 7	2 5	2 2

Rationing.

With the demand far exceeding the supply it was necessary, as in previous years, to ration creamery butter as follows:—

TABLE III.—*Percentage rationing on sales during period February and March,* 1944.

Period 1945–6.	*Percentage.*
September to 13 October..	60%
14 October to 27 October..	50%
28 October to 20 January..	33⅓%
21 January to 3 March..	50%
4 March to 10 March..	60%
11 March to 18 August..	75%
19 August to 31 August..	60%

Cheese.

The quantity of cheese produced by factories in the Union during the year was disappointingly small, showing a shortfall of approximately 2 million pounds on that of the previous year.

Of the total production of just under 15 million pounds, slightly more than 73 per cent. consisted of Cheddar cheese, 25 per cet. of Gouda cheese, and rather less than 2 per cent. of other varieties.

From these figures it will be clear that the consumption of cheese per head of the population in the Union is exceptionally low. It is difficult to estimate what proportion of the non-Europeans can be included under consumers, but it is well known that many of our coloured and native population have long since learnt the value of cheese as an article of food. Had cheese been available, even at the comparatively high price of recent times, there is no doubt that very much larger quantities could have been disposed of.

With the greatly increased consumption of fresh milk and the serious shortage of milk for condensing purposes, there is little likelihood of the cheese-making industry developing to any considerable extent, unless factories are established in new areas suitable for the production of milk. For this, one should look in the first place to our large irrigation schemes and secondly to those parts of the Union which are too far from the large centres of population to be able to enter the fresh milk market.

It is well known that cheese-milk producers are not inclined to switch over to the production of cream for supply to butter factories, notwithstanding the fact that there is a very close relationship between the butterfat and cheese-milk prices as fixed by the Dairy Industry Control Board, and it must therefore not be expected that our creameries will receive additional support at the cost of the cheese-making industry. With the present shortage of butter, which it is hoped will be only temporary, but which may quite easily be of considerable duration, it would not be advisable to open up more cheese factories in what are now butter-producing areas, as this might further reduce the butter output. But it would appear that there is room for cheese factories in parts of the country where conditions are not suitable for sheep farming and where the farms are too small to make ranching possible or beef raising sufficiently remunerative to ensure the required income.

Little propaganda has been made to encourage the consumption of cheese, for the simple reason that there are no supplies available to satisfy the existing demand.

In cheese we have a food of a very high protein value in a most digestible and palatable form, containing all the milk-fat and also the lime, phosphates and vitamins so necessary to build up and maintain a healthy body.

The local consumption should be increased by at least one hundred per cent. Even with a little suitable propaganda and attractive packing and display by the retailers of this product, the industry will not be able to satisfy the demand for a long time to come. The fear that the market may be oversupplied during a really good season, seems to be unfounded.

During the period under review 11,143,507 lb. of Cheddar cheese was graded by officers of this Division before it reached the consumer. Of this quantity 9,592,428 lb. was passed as first grade, 1,435,113 lb. as second grade, 108,286½ lb. as third grade and 7,681½ lb. as undergrade. Expressed as percentages of the whole

quantity, 86·08 per cent. was first grade, 12·88 per cent. second grade, 0·97 per cent. third grade and 0·07 per cent. below grade.

The following are the production figures for cheese over the past eight years, from the pre-war to the post-war period:—

TABLE IV.—*Total production of factory cheese (Union).*

Period. Sept. to Aug.	lb.
1938–39	14,115,960
1939–40	14,064,615
1940–41	13,839,957
1941–42	16,216,489
1942–43	16,614,103
1943–44	16,141,439
1944–45	16,828,924
1945–46	14,968,249

Cheese-milk Prices.

TABLE V.—*Prices paid to suppliers of cheese-milk.*

Period.	Purchased on Gallonage Basis.			Purchased on Butterfat Basis.		
	Basic price per gallon.	Premium.	Total.	Basic price per lb. butterfat.	Premium.	Total.
1945–46	d.	d.	d.	s. d.	d.	s. d.
Sept. to October...	9¾	2½	12¼	2 3	6¾	2 9¾
Nov. to January...	10¼	2	12¼	2 4½	5½	2 10
February to May..	10¾	Nil	10¾	2 5¾	Nil	2 5¾
May to June......	10¾	2	12¾	2 5¾	5½	2 11¼.
July to August....	10¾	2½	13¼	2 5¾	6¾	3 0½.

That 86 per cent. of all the Cheddar cheese manufactured could be classified as first grade is satisfactory when it is borne in mind that much of this cheese had to be marketed before it had time to mature properly. This, of course, was due to the short supply which was experienced during a large part of the year.

As a result of the urgent demand for cheese, manufacturers have no doubt been tempted to accept milk which was not always of the desired quality and this must also be considered as one of the factors responsible for the degrading of approximately 14 per cent. of the output.

Gouda or sweetmilk cheese is either graded "first grade" or "ungraded", and of the 3,630,880 lb. graded, 2,510,216 lb. was passed as first grade, 1,117,712 lb. as ungraded or below first grade and 2,952 lb. classed as damaged (probably in transit). This gives a proportion of 69·1 per cent. first grade, 30·8 per cent. ungraded and 0·08 per cent. damaged.

These figures show that, despite the improvement in the quality of our Gouda cheese during recent years, there is still considerable leeway to be made up. What is cheering, however, is that the best Gouda made in the Union is very good indeed and compares most favourably with the best quallities produced anywhere else, including the country from which this variety of cheese derives its name.

There is a continual large demand for Roquefort and process cheese made in the Union. It is gratifying to be able to state that

the quality of these varieties of cheese has been most satisfactory throughout the year.

Since the quantity of cheese produced was not sufficient to meet the demand, rationing was necessary. As in the case of butter the retailers were rationed by the Dairy Industry Control Board, but the distribution of the available supplies to the consumers had to be entrusted to the retailers.

Rationing was based on the quantities of cheese issued by the Board's agents during February and March, 1944, when there were no restrictions on sales, and the percentages made available were as follows:—

TABLE VI.—*Percentages of issues during February and March*, 1944.

Period. 1945–46	*Percentage.*
September to 3 December, 1945	60%
4 December to 17 March, 1946	40%
18 March to 12 May	60%
13 May to 31 August	70%

Pasteurizing of cheese-milk at our factories has become an almost general practice throughout the country. This has not occurred without considerable capital being laid out in modern plant. The results have shown, however, that this expenditure has been well worth while and improvement in the yield and quality of the product has been considerable.

Practically all cheese factories of any size have installed power whey separators and, despite the fact that there is only some 0·3 per cent. butterfat contained in whey, it has been found that this recovery is well worth while and creameries have welcomed this accession of whey cream.

A total quantity of 14,481,632 lb. of factory cheese was consumed during the year, while 96,670 lb. was supplied as ship's stores and to neighbouring territories. There was no importation of Cheddar or Gouda, but some 50 tons of process cheese entered the Union.

Condensed Milk and Milk Powder.

Due to the fact that practically all of our condensing and milk powder plants are surrounded by cheese factories and are also situated in areas from which the large cities draw their requirements of fresh milk, this section of the industry has had a particularly difficult time as regards the supply of milk.

Notwithstanding the fact that the price of condensing milk has been fixed at 1d. per gallon above the cheese-milk price, producers of the latter commodity do not appear to be inclined to divert their milk from their factories, which are in the majority of cases co-operative undertakings. Many of these co-operative cheese factories, however, temporarily discontinued cheese-making and disposed of the milk in the fluid milk market at more remunerative prices than could be obtained from the condensing factories.

With a lower production in the case of their regular supplies, due to the shortage in concentrates for feeding dairy cows, and with a considerable diversion of milk that should normally be available to the condensing plants, the manufacturers of condensed milk and whole-milk powder, not being able to obtain much or any support from the cheese factories or cheese-milk producers, are placed in a very serious position.

The production of these commodities has probably fallen more than that of any other branch of the dairy industry, and many regular consumers of condensed milk, who are not always in a position to obtain fresh milk in sufficient quantities, have had to go short.

The demand for fresh milk in the cities must be met even if industrial milk has to be diverted. Cheese factories which are in the position to pasteurize their milk and are situated within a reasonable distance from our large centres, can participate in the fluid milk market during times of low production, and will probably do so, to their financial benefit.

Condensing and dried milk factories, with considerable capital invested in buildings and plant cannot, however, afford to switch over.

It is perhaps unfortunate that our condensing factories should be situated in the areas that are best suited for the supply of fresh milk to cities, but this cannot be altered now.

Dairy farming has undoubtedly been severely handicapped by several unfavourable seasons, shortage of suitable concentrates, and other troubles. But these difficulties are not going to last for ever.

There is a good and assured market for the dairy farmer's product, not only for the present and the immediate future, but for very many years to come.

Milk and its products are of the utmost importance for the welfare and health of the nation. The importation of dairy products from other parts of the world may be possible, but this should be done only after our own production has been brought up to the economic maximum. As we are still far from that point, dairy farmers should "go all out" to increase production, not simply by increasing the number of cows in the herd but by improving the average standard of their cows. Even in the best dairying districts there is room for improvement.

Other Dairy Products and By-products.

Several specially prepared milk foods for babies and invalids are now being successfully manufactured in the Union. There would appear to be an increasing demand for these products, but the output has had to be restricted on account of the general shortage of milk experienced almost throughout the year.

Cheese whey and buttermilk have come to be highly valued by farmers as calf and pig feed.

The erection of a plant to manufacture buttermilk powder is now being considered by the owners of a large butter-making concern.

A plant for the recovery of milk sugar and albumen from whey is in operation at one of our larger cheese factories.

It is also interesting to note that a number of large cream producers who farm on the semi-ranching system, have been producing considerable quantities of crude casein from the separated milk which under their method of farming is not required for the feeding of calves.

Considerable quantities of this product are required for industrial purposes and the production of this crude casein, which does not involve much capital outlay, appears to be a very remunerative side-line to farmers who do not require the separated milk for feeding purposes.

Herd Recording.

The past few years have shown how extremely necessary it is that the production of milk should be materially increased. This cannot be done by simply increasing the milk-cow population.

Soil erosion and the urgent necessity for soil reclamation point to the fact that in many areas the number of stock carried should be reduced. It is therefore necessary that the production per cow be increased.

Many high-producing cows are to be found in the dairy herds in the Union but, unfortunately, too many low producers are also maintained, often at a considerable loss to the owner who is in many cases ignorant of this fact.

The true position can only be ascertained by the regular recording of all dairy cows, when strict selection, based on the productive capacity of individual cows and families, can be practised. The recording should be continuous over several lactation periods and preferably over the whole period that the cow remains in the dairy herd.

All dairy-farming countries appreciate this fact, and all have their schemes to suit their own particular conditions. During the past thirty years the Department of Agriculture has extended official milk-recording services to all farmers desirous of improving their dairy herds.

Unfortunately this work has had to be curtailed somewhat during the war period, when a number of the men employed under the official milk-recording scheme went on active military service, while it was not possible to fill such temporary vacancies.

For this reason some ground was lost and the scheme has not progressed as it should have done. The administrative work in connection with the milk recording has fallen behind very considerably.

Adverse climatic conditions, a serious general shortage of concentrates, labour difficulties and the outbreak of "lumpy skin" disease have undoubtedly been the cause of many farmers postponing entering their herds under the official Government milk-recording scheme. Others have probably refrained from applying for the services under the scheme as it was well known that the Deparment was not in a position to accept more than a few new applications, due to the difficulty, already referred to, of finding suitable young men to undertake the work.

Every dairy farmer should have all the cows in milk in the herd regularly recorded for milk and butterfat production, because without proper figures the farmer is to a large extent working in the dark.

It may not be possible for the Department to extend the services to every owner of milk cows in the Union, but this is no reason why such a small percentage of our herds should be tested.

In many areas, where the herds are comparatively small and the distance from farm to farm is not great, cow-testing associations could be formed and the work conducted under the auspices of a farmers' committee. This Division could assist in an advisory capacity. As the information wanted by the owner of non-registered cows is really for his own private use, official records are not required.

In many cases a cheese factory, condensing factory or creamery is the centre of a dairying district and is conveniently situated to undertake the regular recording work on behalf of many of its suppliers.

Registered or stud-book cows will have to be tested under a Government scheme as the records are published and an official guarantee as to the accuracy of the particlars given is required.

At the end of August, 1946, there were 36 milk recorders on the staff of the Division, this number being eight short of the total number of posts approved.

A number of young men are expected to qualify for the post of milk recorder towards the end of 1946 and it is sincerely hoped that the vacancies will then be filled.

The recorders employed averaged 21 testing days each month, which can be considered a satisfactory working unit if the time taken in travelling between farms is taken into consideration. During August, 1946, altogether 3,256 registered cows and 5,920 grade cows were tested, making a total of 9,176 cows. Where the owners of registered cows requested it, the individual cows were also tested for the solids-not-fat content of the milk.

The herds tested during August, 1946, were distributed over the various areas as indicated in the following table:—

TABLE VII.—*Distribution of tested herds.*

AREA.	HERDS.			COWS.	
	Registered.	Grade.	Mixed.	Registered.	Grade.
Cape West..................	42	31	21	764	938
Cape East..................	75	10	14	822	278
Orange Free State...........	46	34	16	513	946
Natal.......................	21	68	12	479	2432
Transvaal..................	27	16	23	678	1326
Union of South Africa........	211	159	86	3256	5920

Although the testing of grade cows was continued and the milk-recording books on the farms reflecting the production of each cow were kept up to date, it was not possible to issue statements of record of performance, and no average production of grade herds was calculated.

During the year under review, 3,004 certificates of record of performance were issued in respect of registered cows which completed their official lactations. The average production of the various registered dairy breeds has been calculated by the Senior Dairy Officer concerned for each of the areas served.

The distribution of the various registered dairy breeds tested and their average production for 300 days during the period 1 September 1944 to 31 August 1945, are given in Tables VIII and IX.

Field Work and Inspection of Factories.

Dairy farmers and the manufacturers of dairy products are often faced with problems which have to be investigated "on the spot". The professional officers of the Division together with the officers of the Dairy Research Institute have been able to assist in solving many of the difficulties arising from time to time.

There can be no doubt that the quality of the butter and cheese manufactured in the Union has steadily improved, but it is also quite clear that there is still room for further improvement. The percentage of second grade cream delivered to the factories can be further reduced and the condition of the milk received at the cheese factories often leaves much to be desired.

For technical advice to be most effective it is necessary that qualified men study the conditions under which the milk is produced at the very source, that is, on the farm.

In pre-war days much work of this nature was undertaken by the dairy officers, but unfortunately facilities for travelling became rather difficult during the war and the field work had to be reduced to a minimum.

As previously referred to in this report, the Division was charged, in 1940, with the grading of all factory cheese and butter before distribution to retailers takes place. At that time it was not possible for the staff to be increased, with the result that the less urgent problems did not receive the attention they would otherwise have had.

More normal conditions are now returing and it is hoped that before long the Division will again be in a position to attend promptly to any request for assistance from farmers and manufacturers.

The following is a statement of duties performed by officers of the Division:—

Farms visited during the year in connection with milk recording	312
Farms visited for the purpose of rendering service	150
Visits of inspection made to creameries, including grading duties	1,316
Visits made to cheese factories for inspection and grading duties	1,135
Visits to other factories and cold stores and dairy-produce grading rooms	1,597
Lectures given at farmers' meetings	19
Judging at dairy shows	1
Butter samples tested for moisture content	170
Examinations in milk testing conducted	56
Examinations in cream testing	88
Examinations in cream grading	52
Examinations in cheese-making	46
Cans of cream (in transit) sampled and tested	997
Cans of cream, grading checked at creameries	8,463

Several officers of the Division also assisted in lecturing and demonstrating to students at agricultural colleges and agricultural trade schools.

TABLE VIII.—*Average Production of Registered Cows which completed a Lactation of 300 days during the Period 1 September 1944 to 31 August 1945.*

AGE CLASSIFICATION.	2 YEARS.			JUNIOR 3.			SENIOR 3.			JUNIOR 4.			SENIOR 4.			MATURE.		
Area where tested.	No. of cows.	Lb. milk per cow.	Lb. B.F. per cow.	No. of cows.	Lb. milk per cow.	Lb. B.F. per cow.	No. of cows.	Lb. milk per cow.	Lb. B.F. per cow.	No. of cows.	Lb. milk per cow.	Lb. B.F. per cow.	No. of cows.	Lb. milk per cow.	Lb. B.F. per cow.	No. of cows.	Lb. milk per cow.	Lb. B.F. per cow.
A.—AYRSHIRES.																		
Cape Western	1	6,994	236·3	3	6,451	230·1	2	4,949	183·2	5	8,210	293·0	1	4,880	137·1	17	9,554	323·4
Cape Eastern	6	6,168	230·1	1	9,400	339·3	1	7,731	288·8	3	7,741	285·3	1	10,415	397·2	11	9,412	351·5
Natal	1	7,300	275·5	2	6,179	267·7	3	6,555	243·8	2	8,254	318·7	3	5,976	266·6	20	7,100	285·5
Transvaal	1	8,829	349·6	6	9,085	329·9	4	10,339	363·1	1	6,821	279·9	1	10,560	357·1	16	9,683	378·0
AVERAGE FOR UNION OF SOUTH AFRICA	9	6,681	249·1	12	7,968	295·3	10	7,865	283·9	11	7,964	294·4	6	7,297	281·8	64	8,795	330·0
B.—BROWN SWISS.																		
Cape Eastern	—	—	—	—	—	—	2	8,017	307·4	—	—	—	1	7,527	310·4	2	11,026	429·8
Orange Free State	2	10,053	406·1	2	8,652	314·9	—	—	—	—	—	—	1	8,431	364·7	4	11,225	409·7
AVERAGE FOR UNION OF SOUTH AFRICA	2	10,053	406·1	2	8,652	314·9	2	8,017	307·4	—	—	—	2	7,979	337·5	6	11,159	416·4
C.—FRIESLANDS.																		
Cape Western	58	8,608	312·2	29	9,688	347·7	28	10,090	362·1	37	9,758	347·7	34	11,196	403·5	135	11,740	404·6
Cape Eastern	159	9,467	358·9	66	9,671	363·5	60	11,348	417·0	63	11,751	441·9	54	12,611	477·7	286	10,537	390·5
Orange Free State	84	8,520	316·2	50	9,220	341·4	44	10,343	376·8	33	9,868	366·7	37	11,178	404·9	173	11,545	417·5
Natal	36	8,132	300·4	22	7,530	274·9	31	8,045	295·1	35	8,977	327·1	26	8,894	328·6	167	9,444	395·1
Transvaal	101	9,149	336·3	44	9,408	341·8	39	10,503	378·4	45	10,499	386·4	24	11,075	400·4	188	11,275	405·7
AVERAGE FOR UNION OF SOUTH AFRICA	438	8,988	334·5	211	9,288	342·3	202	10,285	374·5	213	10,393	383·3	175	11,270	415·1	949	10,846	401·3
D.—GUERNSEYS.																		
Cape Western	—	—	—	—	—	—	3	7,220	310·4	1	8,377	310·8	—	—	—	3	6,429	305·4
Cape Eastern	10	7,110	345·8	2	10,551	494·3	4	7,644	364·0	5	9,711	474·0	—	—	—	10	10,243	480·9
Orange Free State	6	10,871	503·5	2	8,975	436·7	—	—	—	—	—	—	—	—	—	1	12,988	535·4
Transvaal	1	7,139	286·5	1	6,727	305·5	—	—	—	—	—	—	—	—	—	1	7,676	353·0
AVERAGE FOR UNION OF SOUTH AFRICA	17	8,439	398·0	5	9,156	433·5	7	7,462	341·1	6	9,489	446·8	—	—	—	15	9,492	440·9

TABLE IX.—*Average Production of Registered Cows which completed a Lactation of 300 days during the Period 1 September 1944 to 31 August 1945.*

AGE CLASSIFICATION.	2 YEARS.			JUNIOR 3.			SENIOR 3.			JUNIOR 4.			SENIOR 4.			MATURE.		
Area where tested.	No. of cows.	Lb. milk per cow.	Lb. B.F. per cow.	No. of cows.	Lb. milk per cow.	Lb. B.F. per cow.	No. of cows.	Lb. milk per cow.	Lb. B.F. per cow.	No. of cows.	Lb. milk per cow.	Lb. B.F. per cow.	No. of cows.	Lb. milk per cow.	Lb. B.F. per cow.	No. of cows.	Lb. milk per cow.	Lb. B.F. per c w.
E.—RED POLLS.																		
Cape Eastern	3	6,274	231·1	—	—	—	—	—	—	2	6,588	229·9	5	6,184	244·5	17	7,732	286·2
AVERAGE FOR UNION OF SOUTH AFRICA	3	6,274	231·1	—	—	—	—	—	—	2	6,588	229·9	5	6,184	244·5	17	7,732	286·2
F.—DAIRY SHORTHORNS.																		
Cape Eastern	32	5,961	242·0	10	8,216	338·7	7	6,444	252·9	8	8,635	346·0	2	6,667	253·6	34	8,094	318·5
Orange Free State	9	5,552	222·4	3	5,851	241·9	8	6,220	247·4	4	5,938	249·2	3	5,011	200·5	15	6,636	272·8
Natal	—	—	—	—	—	—	1	5,308	186·6	6	6,418	232·9	2	6,334	239·1	11	6,375	239·5
Transvaal	—	—	—	1	9,235	352·8	—	—	—	—	—	—	—	—	—	1	8,892	313·5
AVERAGE FOR UNION OF SOUTH AFRICA	41	5,871	237·7	14	7,782	318·9	16	6,261	246·0	18	7,297	286·8	7	5,862	226·7	61	7,438	292·9

AGE CLASSIFICATION.	JUNIOR 2.			SENIOR 2.			JUNIOR 3.			SENIOR 3.			JUNIOR 4.			SENIOR 4.			MATURE.		
Area where tested.	No. of cows.	Lb. milk per cow.	Lb. B.F. per cow.	No. of cows.	Lb. milk per cow,	Lb. B.F. per cow.	No. of cows.	Lb. milk per cow.	Lb. B.F. per cow.	No. of cows.	Lb. milk per cow.	Lb. B.F. per cow.	No. of cows.	Lb. milk per cow.	Lb. B.F. per cow.	No. of cows.	Lb. milk per cow.	Lb. B.F. per cow.	No. of cows.	Lb. milk per cow.	Lb. B.F. per cow.
G.—JERSEYS.																					
Cape Western	35	6,433	324·1	13	7,528	371·1	14	8,056	400·3	14	7,058	360·9	8	8,358	434·8	9	9,277	440·1	65	8,562	398·5
Cape Eastern	45	5,750	298·9	21	6,441	332·5	30	6,411	347·6	13	7,092	374·1	16	6,291	347·9	13	7,251	366·9	75	7,370	371·6
Orange Free State	4	5,713	286·0	—	—	—	1	6,262	308·5	3	7,272	391·4	—	—	—	2	5,253	268·0	4	5,211	248·6
Natal	8	5,224	276·4	10	6,020	292·1	7	5,976	307·6	9	6,500	332·2	3	5,765	294·7	5	6,558	319·1	30	6,759	348·1
Transvaal	2	4,489	229·1	1	5,377	309·4	2	5,108	262·2	1	8,340	441·5	—	—	—	1	4,774	235·1	—	—	—
AVERAGE FOR UNION OF SOUTH AFRICA	94	5,931	304·3	45	6,638	334·2	54	6,730	352·2	40	6,992	363·1	27	6,845	367·7	30	7,528	368·9	174	7,660	374·8

Research in Agricultural Problems.

Professor H. B. Davel, B.Sc., Director, Agricultural Research Institute, Pretoria.

THE Institute experienced a trying and difficult time during the year under review. Climatic conditions were extremely unfavourable. Although the total rainfall for the summer was only slightly below normal, its distribution was very irregular. By following sound farming methods, however, an average yield of 19 bags of maize per morgen was reaped over an area of 55 morgen which may, in the circumstances, be regarded as very satisfactory. Correspondingly good yields were obtained in respect of silage and fodder crops, with the exception of winter cereals and lucerne on dry-land, which failed completely owing to the very dry autumn and winter.

Practically all the cattle on the Experiment Farm contracted lumpy-skin disease, but fortunately it appeared in a comparatively mild form in most cases. Four pure-bred Frieslands (2 cows and 2 calves) died from the disease.

As far as the general farm and field investigational work is concerned, it may be stated that the war has left its aftermath of worn out implements and machinery, which affected operations considerably. Implements were unprocurable and could not be replaced, thereby greatly hampering essential work. In the field of research fair progress has been maintained.

In regard to the academic activities of the Faculty of Agriculture it is gratifying to report that the upward tendency in the number of students studying agriculture has been well maintained, and from 115 in 1944 and 126 in 1945 the enrolment has risen to 172 this year. Of this number 10 are following the newly instituted courses in soil and veld conservation. During the year two very successful short and refresher courses were conducted by the faculty, one in soil and veld conservation for officials of the Department of Native Affairs but also attended by a number of agricultural officers, and one on pig husbandry for practical farmers.

A New Department.—A new Department of Genetics was created, and Dr. J. D. J. Hofmeyr appointed as its head with the status of Senior Professional Officer, thereby relinquishing the Senior Lectureship in the Department of Agronomy. Mr. C. S. I. Ravenscroft was transferred from the department of Pasture Research to Genetics.

Students.

The following numbers of students are enrolled in the Faculty of Agriculture:—

B.Sc. Agric. 1st Year ...	71	
B.Sc. Agric. 2nd Year ...	21	
B.Sc. Agric. 3rd Year ...	24	
B.Sc. Agric. 4th Year ...	9	124
Special Students ...	1	1
B.Sc. Agric. Eng. 1st Year ...	13	
B.Sc. Agric. Eng. 2nd Year ...	4	
B.Sc. Agric. Eng. 3rd Year ...	1	
B.Sc. Agric. Eng. 4th Year ...	3	21

M.Sc. (Agric.)	10	
D.Sc. (Agric.)	6	16
Soil and Veld Conservation 1st Year	6	
Soil and Veld Conservation 2nd Year	1	
Diploma in Soil and Veld Conservation 1st Year	3	10
TOTAL		172

In addition, the Department of Entomology conducts courses for students registered in the Faculty of Science, as follows:—

D.Sc.	4
M.Sc.	1
B.Sc.	22
TOTAL	27

The following degrees were awarded in 1946:—

M.Sc.(Agric.)	3
B.Sc.(Agric.)	13
B.Sc.(Agric. Eng.)	1
TOTAL	17

Research.

The research and investigational work of the Institute covers a wide field and embraces a great number and variety of experiments, all of which are of fundamental importance to our whole agricultural structure. Unfortunately it is not possible within the compass of this brief report to refer to all of these experiments. Only the main aspects of the work and such results as may be of topical interest are summarized below.

Department of Agronomy.

The research work of this department consists mostly of long-term crop and grassland experiments, with run-off and erosion studies forming an integral part of the whole programme.

The *rotation experiments*, started in 1938-39 on the utilization of crops and rotation effect combined, continued to show that in a three-course rotation of babala and two maize crops the latter were not materially affected when the babala was used as ensilage or a grazing crop, but when ploughed under as a green manure crop the maize yields were markedly increased. With Rhodes grass for three years, followed by maize, the yields of the latter were as good as with maize grown in mono-culture. With maize following cowpeas the yields of the former were significantly better than after Rhodes grass. The yields of maize following cowpeas as a green manure were greatly improved over the yields of maize in mono-culture and the results were almost as good if the cowpeas were harvested for hay instead of being ploughed in.

The studies on *wide espacement of maize* in 6-foot rows compared with 54 in. and 36 in. rows, but with an inter-row spacing adjusted to give the same number of plants per morgen, showed that a lower yield was obtained when the rows were 6 feet apart. These results differed from those previously obtained. Previously no material difference in yield was observed with varying row distances, provided the number of maize plants per morgen remained constant.

The *Unit Experiment* on land utilization continued to furnish results not differing materially from those previously reported. The

milk production was slightly lower than the year before, but the carrying capacity in terms of cows was higher, this being just over 10 cows per 30 acres of arable land.

The *field trials* with crops under irrigation gave results similar to those of previous seasons. With maize under irrigation, 7 tons of kraal manure per morgen raised the production by 18½ bags, 800 pounds of superphosphate per morgen increased the yield by 7½ bags and 400 pounds of ammonium sulphate accounted for an increase of 4 bags per morgen. The residual effect of these fertilizers on peas following on the maize was also marked, being 4½ bags after superphosphate and 3½ bags after kraal manure. The ammonium sulphate resulted in a decrease in pea yields of two bags per morgen. This was no doubt due to the gradual increase in soil acidity brought about by the heavy applications of ammonium sulphate. Muriate of potash had no material effect either on maize or on peas.

In the *wheat-cowpeas series* the kraal manure raised the yield of wheat grain by 12 bags per morgen, while superphosphate increased the yield by 11 bags per morgen, but neither ammonium sulphate nor potash had any material effect. With the follow-up crop of cowpeas, superphosphate increased the green weight of cowpeas by 6 tons, while kraal manure raised it by 14 tons, but ammonium sulphate decreased the yield by 2½ tons per morgen, due again no doubt to the acidity factor. Potash showed a slight beneficial effect on the cowpeas.

In general it would appear that kraal manure and superphosphate in relatively large dressings are required for irrigated crops. Ammonium sulphate improves maize yields, but has no effect on wheat and is definitely prejudicial to peas and cowpeas. In view of the interesting responses obtained, the results are presented below in summarized form.

TABLE I.—*Irrigation experiments* 1945-46. *Yield increases due to fertilizers and irrigation.*

Treatments.	Series A.		Series B.	
	Maize (Grain).	Peas (Grain).	Wheat (Grain).	Cowpeas (Wet produce).
	Bags per morgen.	Bags per morgen.	Bags per morgen.	Tons per morgen.
Irrigation levels*:.......	0·92	4·47	4·77	0·76
Kraal manure†.........	18·46	3·47	11·99	13·98
Superphosphate†........	7·49	4·63	11·32	6·00
Ammonium sulphate†...	4·22	—2·03	1·58	—2·58
Muriate of potash†......	0·64	0·06	0·48	1·58

* Irrigation different only in case of winter crops, i.e. wheat, peas.

† Fertilizers are applied only to maize and wheat; peas and cowpeas rely on residual effect.

The liming experiments in conjunction with fertilizers for crops grown under irrigation showed that lime was without effect on maize, but improved the yields of peas to the extent of about 5 bags per morgen. A slight overall benefit was noticed with wheat, but not with cowpeas.

The data are summarized below:—

TABLE II.—*Irrigation experiments* 1945-46: *Crop yields after lime had been applied to wheat and peas during* 1942 *and* 1943. *Yields are given in bags of grain or tons of hay per morgen.*

Treatments.	SERIES A.		SERIES B.	
	Maize (Grain). b.p.m.	Peas (Grain). b.p.m.	Wheat (Grain). b.p.m.	Cowpeas (Wet produce). t.p.m.
No treatment	20·1	6·9	9·7	23·7
Inorganics	35·9	9·8	27·1	31·0
Manure	35·9	10·3	19·4	35·5
Manure and inorganics	41·5	13·6	33·0	36·7
Mean of treatment without lime..	33·3	10·2	22·3	31·7
Lime	19·9	11·4	13·6	19·9
Lime and inorganics	36·0	16·7	29·7	30·4
Lime and manure	35·6	14·7	23·9	32·7
Lime and manure and inorganics.	44·0	18·3	35·5	37·8
Mean of treatment with lime	33·9	15·3	25·7	30·2

The studies on the utilization of wheat straw and compost made from wheat straw compared with kraal manure, soya bean residues and mineral fertilizers were continued with modifications. The organic matter applications were adjusted on a basis of the same equivalent of combustible material as is contained in a three-ton dressing of wheat straw. The results for the past season are given in Table III.

TABLE III.—*Compost experiment*, 1945-46.

Source of organic matter: Equivalents of combustible material in 3 tons wheat straw.	Wheat (Grain). Bags per Morgen.	Cowpeas (Wet produce). Tons per Morgen.
Wheat straw	9·73	19·20
Compost (wheat straw and manure)	16·95	24·65
Compost (wheat straw and minerals)	19·72	23·26
Kraal manure	26·71	23·03
Soya bean residues	16·65	23·01
Mineral Fertilizers	10·67	20·07

The results in Table III show that even when the organic matter is kept at a constant level, the resulting yields differ considerably. The differences are presumably due to the different amounts of *nutrients* contributed by the organic manures rather than the organic matter *per se*. The effect of the compost and crop residues is such as to place these midway between the straw and the kraal manure as fertilizers.

The dryland-lucerne experiments showed that good yields of hay are possible under dryland conditions. The results suggest not only that dryland lucerne is a useful pasture and hay crop, but also that

its persistency is prolonged, good yields still being obtained four years after establishment. The yields of air-dry hay per morgen were successively about 3½ tons, 9 tons, 4½ tons and 4½ tons for the past four seasons. No significant differences were noted for various rates of seeding tested, either broadcast or in rows. It is proposed to establish a larger patch of lucerne this year and to study its effect as a ley in rotation with summer crops.

Long-term Fertilizer Experiments with Grass.—A number of experiments on the effects of fertilizers on established pastures and veld was continued. These were (*a*) fertilization of a Rhodes and Paspalum mixture, (*b*) fertilization of veld, and (*c*) different kinds and amounts of fertilizers for Rhodes grass and Paspalum in pure stands.

The experiments with the mixed pasture of Rhodes grass and Paspalum showed that the pasture did not react materially to dressings of superphosphate, but markedly so to heavy dressings of ammonium sulphate. The dressings of superphosphate used were 0, 600 and 1,200 pounds per morgen in all possible combinations with 0, 500, 1,000 and 2,000 pounds of ammonium sulphate per morgen. Where no nitrogenous fertilizer was used, the Rhodes grass predominates, but with high dressings of ammonium sulphate the Rhodes grass has been almost entirely replaced by Paspalum.

In a series of experiments along similar lines, but with pure stands of Rhodes grass and Paspalum, respectively, still higher dressings of nitrogen, derived from ammonium sulphate, nitrate of soda and ammonium nitrate, were tested. On the Rhodes grass series the yields of hay were as follows:—

TABLE IV.—*Fertilizers and Rhodes grass.*

Pounds applied per morgen.†	HAY YIELDS IN TONS PER MORGEN.			
	Ammonium sulphate.	Sodium nitrate.	Ammonium nitrate.	Averages.
0	(4)* 3·51	(4) 4·34	(4) 3·97	(12) 3·94
1,000	(4) 6·41	(4) 5·66	(4) 5·45	(12) 5·84
2,000	(4) 6·71	(4) 6·33	(4) 6·51	(12) 6·52
3,000	(4) 7·02	(4) 7·72	(4) 7·04	(12) 7·26
4,000	(4) 6·95	(4) 7·54	(4) 6·82	(12) 7·10
Averages	(20) 6·12	(20) 6·32	(20) 5·96	

* Figures in brackets refer to number of plots averaged.

† Equivalents in terms of nitrogen furnished by ammonium sulphate dressings :
Minimum differences significant at P = 0·05. :—
Comparison of averages of 4 plots = 1·13 tons per morgen.
Comparison of averages of 12 plots = 0·65 tons per morgen.
Comparison of averages of 20 plots = 0·51 tons per morgen.

The results show that Rhodes grass responds well to heavy dressings of nitrogenous fertilizers but that not much advantage is obtained after an application of about 2,000 pounds per morgen. There was no significant difference in the three sources of nitrogen judged on one year's results, but differences due to changes in soil reaction may show up later.

The Paspalum series were not sufficiently far advanced to apply the differential fertilizer treatments which will only commence in 1946-47.

The use of heavy dressings of fertilizer to veld showed on the average a slight response to superphosphate, the hay yields being 3·82, 5·40 and 5·38 tons per morgen with 0, 600 and 1,200 pound applications of superphosphate (i.e. in addition to the dressings of ammonium sulphate used). The overall response to ammonium sulphate was 1·01, 2·42, 3·44, 3·60, 4·12 tons per morgen, respectively, for 0, 1,000, 2,000, 3,000 and 4,000 pounds per morgen of ammonium sulphate. The response to superphosphate is only material with adequate amounts of ammonium sulphate, and apparently there is a decided quantitative relationship between increments of ammonium sulphate and yield. With the large dressings of nitrogen the botanical composition was markedly affected even in a single season. Most of the veld grasses have been injured, except *Eragrostis* spp. which now appears to have become dominant. The results cover only a single season so that it is still too soon to draw very definite conclusions. The trends are, however, not without interest.

In all the experiments with fertilization of grass the following features predominate:—

(1) Superphosphate becomes important only when the nitrogen status of the soil is raised to a high level.

(2) Grass crops—unlike maize—respond well to nitrogenous fertilizers, but in order to be effective *large* dressings are required.

(3) The use of ammonium sulphate affects the succession in a mixed pasture or veld very markedly.

(4) The economics of grass fertilization requires thorough investigation.

Grassland Experiments.—The grassland research programme was continued as a matter of routine and the results are reported in detail in the annual reports issued on this section.

Department of Agricultural Chemistry.

The accumulated data of the lysimeter experiments on the Experiment Farm have now been collated and written up for publication. These experiments were started in 1930 when the Faculty of Agriculture initiated a series of investigations on the general problem of moisture utilization and dissipation, this being the first serious attempt in South Africa to approach and investigate the drought and erosion problem scientifically. Unfortunately its funds and facilities did not allow the Faculty to carry out these investigations on a more comprehensive scale.

Briefly the results obtained indicate that only 11·7 per cent. of rain percolates to a depth of 5 feet on bare soil on which the surface is kept loose and permeable by frequent cultivation; under a fertilized maize crop the percolation amounted to only 3 per cent. of the rainfall, and where manure was applied it fell to 2·2 per cent. as a result of the higher yield produced by the manure.

In a latter series of lysimeters under a natural grass cover and so constructed that no run-off takes place, the percolation to a depth of 4 feet amounted to only 2·08 per cent.; at 3 feet 4·5 per cent. and at 2 feet 6·8 per cent. of the rainfall leached through.

These results emphasize the power of the plant to dry out the soil and it makes little difference whether the plants are widely spaced as in the case of maize, or closely like grass. In respect of the

summer-rainfall areas it appears, therefore, that only insignificant quantities of rainwater will penetrate to the underground reservoirs while the crops are growing actively. Only rain falling in the late summer or winter, when the plants are dormant or their growth has abated, has a chance of reaching these reservoirs.

Department of Animal Husbandry.

Livestock.

(1) *Friesland herd.*—The progeny of the junior herd sire, Brakfontein de Beste Melkman, are very promising. A number of daughters of the senior herd sire, Brakfontein Bles Jetsches Bert, are now in milk and the production records obtained thus far are very satisfactory. In order to maintain and improve the standard of the herd it will be essential to import a first class sire from Holland. In addition it would be advisable to import one or two females to strengthen the breeding value of the herd. Several promising young bulls have been transferred to other government institutions during the past year.

(2) *Africander herd.*—Further progress has been made in the breeding of the Africander herd. The junior herd sire, Zwawelfontein Unie, has developed into an outstanding young bull. His first crop of calves is expected towards the end of this year. A number of young Africander bulls were transferred to other institutions.

(3) *Pigs.*—The Institution has been fortunate in acquiring one Large White boar and two Large White sows from the famous Histon stud in Great Britain. A large number of stud boars and gilts have been transferred to other institutions or sold to farmers. Several important improvements have been made to the pig plant. A new weighing bridge has been erected and the construction of a number of pig sties is in progress.

Research.

The research programme in connection with the determination of the breeding value of Friesland bulls in South Africa was continued. The results indicate:—

(*a*) The need for the introduction of new blood into the Friesland herds of South Africa by importing a number of sires from Friesland.

(*b*) An urgent need for improving the methods of food conservation, feeding and management in a large number of dairy herds in South Africa. The results of the study on the breeding value of a number of bulls were published in *Farming in South Africa.*

The Influence of Environmental Factors upon the Quantitative and Qualitative Production of Milk.—From the mass of data available in the official milk records which have been obtained under the Government Milk Testing Scheme, an analysis has been made to ascertain:—

(i) The influence of the time of calving upon the composition and total milk yield of cows during the various stages of their lactation, and

(ii) the influence of the variations encountered in the environmental conditions of different areas in South Africa upon the seasonal production of dairy cows and the composition of the milk.

The data for the following areas have been analysed:—

(1) Western Cape Province.
(2) Oudtshoorn Irrigation area.
(3) Eastern Cape Province, Bedford and Adelaide.
(4) North-eastern Karoo, Middelburg, Steynsburg and Colesberg.
(5) North-eastern sour grassveld area of the Eastern Cape Province.
(6) Eastern Orange Free State.
(7) Western Transvaal.
(8) Central Transvaal city milk producing area.
(9) Natal.

The analyses show:—

(1) Striking variations in the shape of the lactation curves of cows calving during the same month in different parts of the Union.
(2) Marked variations in the shape of the lactation curves and the total milk yield of cows calving during different seasons of the year.
(3) Similar differences in the composition of the milk during various seasons of the year.

The results further indicate that environmental and seasonal fluctuations have an important influence upon the yield and composition of milk and that the feeding and management in most of the dairy herds will have to be improved.

Zoning of Natural Farming Regions of South Africa.—A preliminary survey of the natural farming regions of South Africa has been completed and mapped. The animal production of these regions has been carefully studied and it appears that there is an urgent need for adjusting animal and crop production in harmony with the natural environmental controls. Adjustment of the farming systems and practices is essential in order to increase the level of food production and to prevent further exploitation of the veld and soil resulting in erosion.

Pig Experiments.—A study of the factors influencing the cost of production of breeding pigs shows that fertility and the milk-giving qualities of sows have an important bearing on the cost of production.

The value of creep feeding in the production of weaners is being studied.

Sheep Experiments.—Work in connection with the development of a non-woolled mutton breed for the semi-arid areas from the Dorset Horn–Persian half-bred or three-quarter-bred is being continued. The results now extend to the third generation of the "Dorsian" and show promise of being crowned with success.

Some mutton Merino ewes in lamb to a mutton Merino ram have been presented to the Institution by Messrs. Frasers, Ltd. The suitability of this breed as a mutton type of woolled sheep for the grassveld areas of higher rainfall is being investigated.

The Nutritional and Climatological Project using different types of sheep has been continued. The results obtained in the first year indicate that:—

(1) The feed requirements for the maintenance of body weight and normal wool growth are in descending order for the following: Merino, Dorset Horn and Merino half-bred, Dorset Horn and Persian half-bred and Blackhead Persian.
(2) There was no difference in the efficiency of the different types of sheep in digesting their feed.

(3) Over a period of a year, keeping the sheep in the sun or shade showed no difference in their feed requirements, efficiency of digestion or rectal temperatures, except that in the early afternoon the sheep kept in the sun had higher temperatures than those kept in the shade.

(4) It would appear that some of the nutrients may be better digested in winter than in the summer.

Department of Entomology.

This Department was formerly responsible for all the locust research work, but has now handed most of the work over to the Chief Locust Officer, and more time is being devoted to investigations in the taxonomy of Thysanoptera (thrips) and ants. Intensive study is also being devoted to the anatomy and biology of termites.

Department of Biochemistry.

Studies on Intermittent Inanition in the Feeding of Poultry.

In last year's report the plan of this study, as well as the results obtained with the cockerels, was briefly outlined. It was then stated that inanition exerted no appreciable effect on the growth and tissue composition of the various groups of fowls studied.

During the past year, the work with the pullets was concluded. The rations and the method of feeding were identical with those used with the cockerels, but in this case growth, mortality and egg-production served as the criteria.

The results show that the pullets were more susceptible to the treatments applied than the cockerels, as the growth and egg-production of the underfed groups were much lower than the growth and production of the control group. The average increase in weight and egg-production of the control group, over a period of one year, was 1,414 grammes and 127 eggs, respectively, whereas the corresponding averages for the two underfed groups amounted to 1,360 grammes and 81 eggs. The percentage mortality, out of 30 birds in each group, was 20 per cent. for the control and 27 per cent. (average) for the underfed groups.

According to expectation, the underfed animals utilized their food more efficiently than the controls. For instance, in order to gain the same amount in weight, the underfed groups consumed on the average 18 per cent. less food than the control group. This saving in food consumption did not, however, compensate for the lower egg-production.

Trituration of Calcium Phosphate in Relation to the Utilization of Calcium and Phosphorus.

The advocates of the so-called Schuessler or Biochemic Remedies such as Calcarea Phosphorica and others maintain that the mineral elements in these preparations are utilized to a greater extent than in the corresponding laboratory salts. Their claim is based on the "infinitesimal reduction" and dilution of the mineral substances which, according to them, permits ready assimilation and diffusion of the mineral salts into the cells and tissues of the body, thus enhancing their therapeutic effectiveness to a remarkable extent.

All the Biochemic Remedies contain lactose as a diluent. It is well known that lactose promotes the absorption of calcium and phosphorus by virtue of a greater acidity in the intestinal tract brought about by the bacterial fermentation of lactose to lactic acid. The question now arises as to whether the better utilization of the mineral elements in the Biochemic Remedies is due solely to the presence of the lactose or whether the trituration and comminution also play a part.

In order to gain more information on this point, three groups of young rats were given the following supplements to an ordinary synthetic basal ration:—

Group I received the ordinary tricalcium phosphate, Group II received tricalcium phosphate in the form of Calcarea Phosphorica (a concentrated form of calcium phosphate, specially manufactured for this experiment), and Group III received ordinary tricalcium phosphate and lactose. The calcium and phosphorus contents of all the rations were the same but slightly below optimum for normal growth, the lactose contents (viz. 35 per cent.) of rations II and III were also equalized.

The rats were kept in individual cages and all the animals received the same amount of food daily; that is, their calcium and phosphorus intakes were the same. After five weeks the rats were killed and their femurs removed. Ash determinations were then made on the individual moisture and fat-free femurs.

The results showed that the ash content of the femurs of Group II was the highest, that of Group I the lowest, while that of Group III fell in between the two. It is therefore concluded that the utilization of calcium and phosphorus is not only promoted by the presence of lactose but also by the "infinitesimal reduction" of the calcium phosphate.

In a balance experiment with rats on the same rations, a study is being made of the percentage retention of calcium and phosphorus at monthly intervals of the animal's life.

The Relation between Calcium Intake and Uric Acid Metabolism in Laying Hens.

As laying birds require large amounts of calcium for egg-shell formation, the general practice in the past has been to feed calcium-rich rations to the laying stock. The feeding of these rations, however, resulted in high mortality which dropped considerably when the calcium content was lowered.

It is surmised, therefore, that the system of the animal eventually collapses under the strain of metabolizing such large amounts of calcium. Under the circumstances the kidneys through which the excess calcium is filtered, would be among the first organs to show signs of stress. Furthermore, if this reasoning is correct, one would expect that an impaired renal function would give rise to an accumulation of uric acid in the blood, as all the nitrogenous waste products in birds are converted to uric acid prior to their excretion through the kidneys.

In order to test this theory, one group of hens is being fed a "normal" calcium ration (1·5 per cent. Ca.), whereas a second group is receiving a high calcium ration (3 per cent. Ca.). At two-monthly intervals balance determinations are made of calcium, phosphorus and uric acid on certain birds of each group. A record is also kept of the uric acid content of the blood. No conclusions can as yet be drawn as the experiment has not progressed far enough.

Department of Dairying.

Investigation of the Composition of South African Factory Cheese.

Period March 1945 to August 1946.

During the past 17 months, 303 cheese samples have been analysed. The samples were received from 15 different cheese factories which are more or less evenly distributed over the Union.

Thus far 214 Cheddar and 89 Gouda cheese have been analysed. The following is the average composition of the samples analysed:—

I. Cheddar Cheese.

Analysis of 214 samples, with average age of 105 days, supplied by 11 factories.

Constituent.	Composition.	
	Wet basis percentage.	Dry basis percentage.
Moisture	32·377	0
Total solids	67·623	100
Ash	3·728	5·516
Fat	36·117	53·435
Proteins	25·662	38·059
Chlorides (Cl.)	0·997	1·491
Phosphorus (P.)	0·558	0·827
Calcium (Ca.)	0·736	1·093

II. Gouda Cheese.

Analysis of 89 samples, with average age of 77 days, supplied by 4 factories.

Constituent.	Average Composition.	
	Wet basis percentage.	Dry basis percentage.
Moisture	34·430	0
Total solids	65·570	100
Ash	4·051	6·203
Fat	34·733	52·967
Proteins	24·837	37·696
Chlorides (Cl.)	1·067	1·641
Phosphorus (P.)	0·568	0·865
Calcium (Ca.)	0·771	1·175

From the foregoing analyses it is evident that on a dry basis there is comparatively little difference in composition of Cheddar and Gouda cheese. This is also the position when the cheese is waxed. There is, however, a marked difference in the moisture content of waxed and unwaxed cheese in both types, as shown by the following figures:—

Type of Cheese.	Average percentage of moisture.	
	Waxed.	Unwaxed.
Gouda	37·203	31·656
Cheddar	34·182	30·572

From the point of view of yield per 1,000 lb. of milk this difference may throw some light on the low average yield per unit weight of milk obtained in our factories.

The legal standard for the fat content of cheese is 45 per cent. on a dry basis. The lowest percentage of fat on a dry basis found in

the cheese analysed in this investigation was 49 per cent. The investigation is to continue until March 1947 to determine any seasonal and local variations.

The Composition of Milk Supplied by Producers to the City Distributive Trade.

During the twelve-month period 14 August 1944 to 16 July 1945, altogether 1,608 samples of milk were taken of the incoming supplies received from all producers at a Pretoria milk plant. The samples were taken every fortnight and it is estimated that they represented the bulk milk of about 3,800 cows. The mean composition of all the milk samples was:—

	Per cent.
Total Solids	12·12
Fat	3·51
Solids-not-fat	8·61
Ash	0·737
Protein	3·19
Lactose	4·69

Except for ash, the mean composition of the milk, especially in solids-not-fat and protein, is poorer than the composition given for milk in Great Britain and the United States of America.

The highest monthly averages for fat were found in those months in which the lowest mean air temperatures occurred (i.e. in winter) and *vice versa*. Variations in rainfall did not appear to affect the fat content of milk.

In the case of the solids-not-fat content, however, air temperatures do not appear to have any influence. The highest monthly average for solids-not-fat was found in November 1944, the month in which the first heavy seasonal rains occurred. The lowest mean tests for solids-not-fat were found to occur in the dry months of July, August and September. The solids-not-fat constituents, which were mainly affected by this trend, were the ash and lactose, although the protein was also found to be low in the late dry winter months.

A comparison of the variations in the composition of milk, as revealed in this study with research work conducted on the seasonal variation in the nutritive value of pastures, showed that there is apparently a relationship between the feeding value of veld and the mean solids-not-fat content of milk. Less than 8 per cent. of the supplies failed to test 8·5 per cent. solids-not-fat during November.

Over a period of one year there appeared to be little difference in the composition of morning or evening milk, the evening milk being slightly higher in fat ($\pm 0{\cdot}14$ per cent.) and the morning milk slightly higher in solids-not-fat ($\pm 0{\cdot}11$ per cent.).

More than 25 per cent. of the 46 dairy farmers whose supplies formed the subject of this study, produced milk with a mean solids-not-fat content of less than 8·5 per cent. for the whole period. The means for protein were also unsatisfactory as 58 per cent. of the producers sent in milk which averaged less than 3·2 per cent. in respect of this constituent.

From a study of the results of bacterial tests made by the S.A. Veterinary Corps on the morning milk received at the plant, it appears that mastitis may be an important contributing cause of the low solids-not-fat content of much of the supplies.

Added water was found in the supplies of only two producers. From the abnormal composition of the milk received from two producers it was concluded that they partly skimmed their milk.

The fat content was below standard in 2·8 per cent. of the milk sampled. The solids-not-fat was deficient in 35·4 per cent. of the supplies, 33 per cent. testing between 8·0 per cent. and 8·5 per cent. solids-not-fat. Twenty-nine producers supplied milk which was never found to be deficient in fat.

Department of Genetics and Plant Breeding.

Vegetable breeding.—The selection and breeding of onions was started in 1943 and attention was focussed especially on a local variety grown in the Uniondale district. Through selection this variety has been developed to a high degree of purity. It proved to be outstanding as regards yield, eating and keeping qualities. Some of the best bulbs were selected and planted for seed production with the object of conducting further tests on a more comprehensive scale.

Maize breeding.—A cross between the yellow variety Hotnot and Potchefstroom Pearl was made in 1943. The progeny was backcrossed through 5 generations to the latter by growing two generations per year. The result has been a type showing great similarity to Potchefstroom Pearl, with the exception of the colour of the seed which is yellow. Crosses were also made between Sahara and Potchefstroom Pearl, Robyn and Potchefstroom Pearl, etc.

Progress has been made in the breeding of maize for canning purposes.

Broom sorghums.—Selection work is in progress with the object of producing three types of fibre, namely, coarse, medium and fine.

Department of Poultry Husbandry.

Nutritional experiments had to be limited during the past year on account of the fact that certain feeds were unobtainable. In spite of this difficulty, experiments were conducted to determine the rate of growth in chicks on all-mash rations and the percentage mortality was slightly higher on the high calcium than on the low calcium rations.

The cockerels were removed from the various experimental groups at 16 weeks of age, while the pullets were retained for egg-production studies. The results obtained indicate fairly definitely that maximum levels of calcium should not be included in laying mashes if scratch grain is rationed. It is recommended that a laying mash should contain approximately 2 to 2·2 per cent. of calcium and 1 to 1·1 per cent. of phosphorus. If maximum levels of calcium are fed in mashes to pullets from 8 weeks of age, it is found that they consume more mash than grain and that various abnormalities occur, resulting in high mortality.

The breeding of a sex-linked fowl, that is an auto- or self-sexing breed, has progressed to the stage where the sexes can be identified at day-old by their down colour, the males being lighter in colour than the females. Steps are now being taken to improve the quality of this new breed.

Department of Horticulture.

During the past year the normal routine in respect of the research activities of the Citrus Research Station at Addo was continued. The main experiments in progress at present include (*a*) irrigation demonstration trials in several citrus orchards, (*b*) fertilizer trials, the main experiment being carried out on Valencia orange trees at Sunland Farms, where outstanding responses have been obtained from the application of nitrogenous fertilizers, and (*c*) a study of the decline

of grapefruit trees (so-called "stem pitting and small counts") in suppport the Institute is deeply indebted to the Company. A separate report on the research work conducted in the Valley is issued annually and circulated amongst the growers of this area.

The Research Station receives an annual grant of £600 from the Sunday's River Citrus Co-operative Company. For this financial support the Institute is deeply indebted to the Company. A separate report on the research work conducted in the Valley is issued annually and circulated amongst the growers of this area.

Soil fertility and nutritional studies on citrus.—Apart from a few soil samples obtained from the Tzaneen area, no further soil studies were undertaken during the past year. It is felt that sufficient data are now available for satisfactory fertilizer programmes to be laid down for the various citrus areas in South Africa. Further studies are necessary, however, in order to aid in the solution of specific nutritional problems.

Pot experiments are being conducted in which young Valencia orange trees are grown in soil from White River, the main object being to throw light on the so-called "greening" disease affecting citrus fruit in this area. Thus far no definite results can be reported.

During the past year a nutritional trial using the sand culture technique was started in order to study the rôle played by magnesium in citrus nutrition. Apart from the general problem of magnesium deficiency which occurs in several parts of the Union, there is a possibility of excessive supplies of this element being present in other areas, such as Rustenburg.

Sour-orange rootstock problem.—In view of the possibility that the incompatibility between the sour-orange rootstock and certain scion varieties of citrus may be of a pathological nature(*cf.* 1945 report), it was decided to conduct further studies on this problem in co-operation with the Division of Botany and Plant Pathology. If a virus should be responsible for this peculiar behaviour of the sour-orange rootstock, then it might be possible to eliminate infection by raising rootstock and scion material in a glass-house free from insects. The necessary glass-house facilities are being provided by the Divisio of Botany and Plant Pathology, and steps have been taken to obtain the necessary seedling material of various species of citrus. This type of work is necessarily of a long-term nature so that definite results are not expected for at least four or five years.

Department of Veterinary Science.

The research activities of this Department include studies on the antigenic values of salmonellas, paratyphoid in calves and abortion in mares caused by nutritional disturbances as well as infection.

The chemico-therapeutical treatment of mastitis had unfortunately to be suspended due to apparatus and chemicals being unobtainable.

The determinations on the extent to which city milk supplies carry tubercular infection are being continued.

Insect Pests and Their Control.

T. J. Naude, M.Sc., Ph.D., Chief, Division of Entomology.

ALTHOUGH the headquarters of the Division are at Pretoria where some of the research work is also conducted, the main centres of investigational activity are scattered throughout the country, namely at the four Agricultural Colleges, at Nelspruit Research Station, at Rustenburg, Port Elizabeth, Capetown, Uitenhage, Fort Beaufort and Bethlehem, whilst on many occasions work is undertaken at any convenient centre where suitable conditions are encountered. Bethlehem is a new station, designed to serve the interests of the eastern Orange Free State in particular, and a new unit has also been established in Pretoria to give special and full-time attention to insecticide questions.

Plant Regulatory Service.

Amongst the main items handled by the Plant Regulatory Board during the past year may be mentioned bacterial canker of tomato, bacterial ring-rot of potato, potato blight, citrus black spot, the desirability of registering carnation nurseries, black scab or warty disease of potatoes, the importation of stone fruits from America and the importation of citrus peel. The regulations on the treatment of citrus trees by nurserymen has been amended in order to evade the danger attendant on the compulsory fumigation of citrus trees after spraying with Bordeaux mixture. Additions have been made to the number of sugar-cane varieties permitted for distribution in the Union. The removal of potato and other root crops from the townships of Charlestown, Volksrust and Wakkerstroom has been prohibited by regulation in order to combat the spread of warty disease, *Synchitrium endobioticum*. Regulations have been promulgated under the Veld and Forest Conservation Act to combat the spread of certain insect pests in timber. The number of permits issued during the year for the introduction of plants and plant products total 488, whilst 134 and 48 respectively were issued in respect of the introduction of bees-wax and seed potatoes. Plant export certificates total 1209. Owing to the urgent demand for cotton, cotton seed and oil, some relaxation has been granted in respect of import conditions for these products. Nursery registration has reached a record total of 636, the number of trees in these nurseries reaching the following totals: Mixed trees and plants, 30,342,148; citrus stocks, 573,300; deciduous stocks, 2,753,100; and vines, 7,653,000. Nursery quarantines imposed total five, four of which were lifted on re-inspection. The revenue totalled £1,894.

Biological Control of Cactus.

The main feature of the year under review is the encouragingly large acreage of prickly pear felled, either by the Department or by farmers under Government subsidy, as a result of the destructive work of cochineal distributed in the preceding years. This success in felling is definitely of much wider applicaton than was anticipated two or three years ago, when cochineal showed every sign of very rapid decline. Fortunately, the three seasons of almost continuous drought, which did so much harm in many other directions, served greatly to favour the re-generation of the cochineal infestations through a retarding effect on natural enemies and rendered possible successful felling, not only in problematical zones of the Karroo

prickly pear belt, but also well into the sub-coastal zone. If the felling thus far undertaken is final—and there are good reasons for expecting that it will be final—then the main residual bodies of relatively healthy pear will be confined to a few coastal and subcoastal districts, namely Peddie, Albany, Bathurst, Port Elizabeth and Uitenhage. The success here indicated must be attributed to the work of *Cactoblastis* and cochineal, a third insect introdused, namely, *Lagochirus funestus*, having proved a complete failure in practice in spite of the fact that 628,582 insects were liberated in various localities in the course of several seasons. In an attempt to cope with this residual area, a fourth insect, *Cactophagus spinolae*, has just been imported and is being bred at Uitenhage for trial distribution. In the meantime, scientific observations on the progress of the insects previously introduced are being maintained. For instance, in respect of *Cactoblastis* the general causes of mortality, as also predators, parasites and disease, are all being kept under observation by systematic record. The insect still occurs in small numbers, but at present has no appreciable effect on the re-growth of prickly pear. As far as cochineal is concerned, similar observations are being maintained. Among the more important factors, Coccinellid predators, *Empusa lecanii* (which in spite of drought conditions persist in 60 per cent. of the localities kept under observation), and parasites of *Exochomus* may be specially mentioned. An attempt has been made to use Coccinellid predators towards assisting farmers who are anxious to save their spineless cactus from the depredations of cochineal. Unfortunately, the numbers required for this task render such a project entirely impracticable. On the other hand, cochineal has proved to be very susceptible to some of the new insecticides such as D.D.T., and spray tests are proceeding, although it is feared that their application in practice would prove rather expensive. Jointed cactus cochineal, *Dactylopius* near *confusus*, has been studied in relation to its effect on jointed cactus, *Opuntia aurantiaca*, with the result that no deterioration of the toxicity of the insect to this weed can be detected and it seems quite certain that if the natural enemies of this cochineal, namely rodents and veld ants, could be dealt with in practice, the insect would immediately regain its usefulness in the eradication of this weed. As regards *L. funestus*, a complete account of its life history and biology thus far undertaken under South African conditions has been prepared. A comprehensive report on the whole effort towards biological control of *Opuntias* during the past fourteen years has also been compiled.

Locust Control and Research.

A full account of locust outbreaks and campaigns conducted is contained in a seperate report under the heading "Locust Destruction".

The Brown Locust (*Locustana pardalina* Wlk.).—The brown locust population has been at a low level throughout the outbreak region. The swarm phase of the species has not been seen anywhere except where hoppers hatched on a small scale from two old nests. There is evidence, however, that the solitary phase is building up to a recrudescence of the swarming phase, but the process has been slow as a result of the protracted drought in the Karroo.

As in previous years, observations on the fluctuation of locust populations have been continued in the Middelburg outbreak area and also on selected farms in the De Aar district. Work on the effect of different grazing practices on the incidence of solitary

locusts is being continued. An attempt was made to study the question of possible migration among solitary locusts by means of a marking experiment. Nine thousand scattered solitary phase locusts were caught over an area of three morgen. These were marked on the thorax with a yellow lacquer paint and liberated again immediately. Surveys and counts of the locusts carried out on the spot and in the vicinity subsequently indicated that migration of solitary locusts is restricted to short flights only, no marked individuals being recovered more than 800 yards away from the place of liberation.

The area over which observations on the solitary populations are being made has been further extended to include a part of the Kenhardt district, where the farm of Jagbult has been selected for detailed investigations. These investigations include microclimate studies comparable with those regularly carried out in the Middelburg area, and also a botanical survey by the Union Botanical Survey staff.

Senior locust officers have also been assisting the research staff to keep a close check on the incidence of solitary locusts throughout the outbreak region, and records are kept of the population counts taken. In this way it was possible to locate the areas where incipient outbreaks are likely to occur during the coming season and also to ascertain more exactly the environmental conditions, such as rainfall and vegetation types, associated with rapid population increases. More of such data will have to be accumulated before a complete picture is obtained of how solitary populations build up to swarm proportions, particularly in cases where incipient outbreaks occur in areas where the solitary population is known to have been at a low level during preceding locust generations. It now seems almost certain that one explanation of unexpectedly rapid increases in population is that only a proportion of the eggs in the ground hatches when conditions of soil moisture and temperature are marginal as, for example, when the soil is sufficiently moist but temperatures low, or when temperatures are suitable but the soil rather dry. Since locust eggs can remain viable for long periods, the majority of them may accumulate in the ground over a number of generations during periods when such marginal conditions prevail and only hatch when temperature and soil moisture conditions are both optimum at the same time.

Red Locust (*Nomadacris Septemfasciata* Serv.).—There have been no swarms of this species in the Union during the period under review.

At Lake Rukwa, in Tanganyika, the International Red Locust Control Service carried out a vigorous and successful campaign against a serious incipient outbreak. The Union contributed £10,000 and the services of an entomologist and a senior locust officer for this work. The almost complete destruction of this outbreak has no doubt prevented the initiation of a new swarming cycle such as began in this area between 1927 and 1930, resulting in the regular annual invasions which the Union experienced between 1933 and 1944. A few small swarms are known to have survived these operations and consequently another campaign will be necessary at the end of this year. Swarms have also been reported from Angola, but it is almost certain that these are not the escapes from the outbreak area but rather the tail end of the previous swarm cycle. It is expected that the Union will in future take a full and active share in this effort.

In the Union, regular surveys of the coastal belt and the Eastern Transvaal and Swaziland have been made to determine how long after the disappearance of swarms the locusts can survive in their solitary phase and whether there are any indications that they can then breed up sufficiently to initiate swarming independently of invasion by swarms from beyond the borders of the Union. In the 1944-45 surveys no locusts could be found, but during May and July 1946 the surveys revealed a scattered solitary population in several widely separated localities. It is not certain whether these locusts are the progeny of some that escaped detection the previous year, or whether their parents entered the country in loose swarms without attracting attention or being reported. The surveys will have to be extended and continued to ascertain with certainty whether there are any potential outbreak centres in the Union or not.

With the same objects as outlined above, a survey was made of a large part of the Bechuanaland Protectorate during June-July 1946. The indications are that Bechuanaland is not important from the point of view of initiating the swarming phase, though this should be verified by future surveys, which should also be extended to include the Caprivi Strip.

Cage and Laboratory Experiments.

Research conducted to test substitutes for arsenite of soda as a locust poison has indicated that dinitro-ortho-cresol shows promise in dust or spray form. Dissolved in fuel oils it is a powerful contact spray and has possibilities as a spray from the air against adult locusts which cannot be as effectively controlled as hoppers by means of poisoned bait.

D.D.T. does not seem to be effective against locusts at ordinary strengths, either as dust or spray or in baits.

The new poison, benzene hexachloride, commonly known as 666 or gammexane, has given excellent results in baits, being quick in its action and also practically harmless to vegetation and higher animals. This is now being manufactured in this country and it seems likely that it will replace arsenite of soda entirely in bait against hoppers. Field-scale trials with benzene hexachloride bait will be undertaken during the coming summer months. Laboratory tests have indicated that it can be used in conjunction with the sodium arsenite bait in stock, to which it can be added together with sawdust as a diluent. In this way it seems likely that bait stocks can be doubled for about half of what it would cost to make the same amount of the standard 3 per cent. sodium arsenite-bran bait.

Pests of Citrus and Subtropical Fruit.

False Codling Moth (*Argyroploce leucotreta*). — Appreciable infestations occurred in various areas over the past season, but nowhere was a very high percentage fruit loss recorded. From long-range observations at Nelspruit, orchards in which thorough sanitation is practised, show a consistently lower loss from this pest than orchards not so treated. In the latter, however, there seems to be little tendency in most seasons towards an alarming increase of the pest. In the last two years the insect has been identified with fungus infection in avocado fruits. In this connection spraying experiments with lead arsenate and Bordeaux mixture, and with a suspension of D.D.T. designed to reduce false codling incidence, have given satisfactory results, the D.D.T. being

distinctly superior. It has proved cheaper, however, to cover individual fruits with paper bags for the same purpose and this method has given protection superior to that attained by spraying.

Citrus Thrips (*Scirtothrips aurantii*).—It has now been definitely established that there is no actual difference in the response to tartar emetic and citrometic baits between thrips populations at Nelspruit and Rustenburg. The application of these insecticides therefore stands approved as an effective control measure. In the meantime, further insecticides have been tried in the laboratory and alcoholic suspensions of D.D.T. as low as 0·001 per cent. active ingredient have been found very promising, but 5 per cent. D.D.T. dust was less effective.

Red Scale (*Aonidiella aurantii*).—In the past few years there have been several cases reported, in which natural control of the pest seems to be in evidence and this has resulted in a wide-spread and urgent interest towards a general use of this method. Such control, however, is usually not of permanent nature and in several cases fumigation has again to be resorted to to save the trees. Work on apparently resistant red scale in the Kat River Valley has been seriously thwarted by prolonged drought conditions, but will be resumed as soon as conditions approach normal. Long-range oil spray experiments which have been carried out for a series of years, are being concluded this year and analyses of the results should shortly be available.

Citrus Snout Beetle (*Sciobius granosus*).—Work on this insect has been seriously hampered by drought conditions on account of which no infestation occurred, and soil-insecticide tests with pentachlorophenol, which gave very promising small-scale results, could not be undertaken. Physiological work in connection with the biology and nutrition of this insect has also been stopped on account of staff resignations.

At Nelspruit it was found that spraying with Bordeaux mixture for the control of black spot disease exercised a very beneficial effect in the control of the mango weevil, *Cryptorrynchus mangiferae*. Near East London pineapple scale, *Diaspis bromeliae*, reached serious proportions, apparently on account of an upset of biological control which, however, is now largely restored.

Pests of Deciduous Fruit.

Codling Moth (*Cydia Pomonella*).—In the Langkloof Valley considerable time has been spent in improving codling control on apples, where it was found that the main reason for satisfactory results was to be sought in thorough and regular spraying. In the Western Province the Division is keeping in close touch with efforts towards biological control of codling moth by the Western Province Research Station. In the Transvaal where pome-fruit production is limited, a check is also being kept on the results of spraying at certain convenient localities.

Fruit Fly (*Pterandrus capitata* and *Pterandrus rosa*).—At Port Elizabeth new compounds, including D.D.T., are being tested for the purpose of improving baiting, if possible.

Pests of Stored Products.

In so far as tobacco, dried fruit, confectionery, grain and milled products pests are concerned, the main emphasis over the past season was on routine advice. At Capetown research work

in this field has had to be very limited on account of the preponderance of timber insect troubles. At Potchefstroom life history studies of stored-grain pests are being continued and at Port Elizabeth very useful additional data have been compiled on the life history of *Tribolium confusum*.

Forest Insects.

Outbreaks of the pine tree emperor moth, *Nudaurelia cytherea*, in three different areas in the western Cape Province have been successfully controled by the use of pigs. In the Transvaal, the pine brown tail moth, *Euproctis terminalis*, has suffered a sudden decline from natural causes other than parasites. The latter, however, are steadily increasing towards a more effective complex. In Natal, wattle bagworm, *Acanthopsyche junodi*, wattle looper, *Achaea lienardi* and wattle jassids, mainly *Bythoscopus cedaranus*, continue to receive attention. The records of many years on incidence of disease, general ecology and general biology are beginning to bear fruit in as much as a fairly clear picture of the nature of bagworm cycles and the importance of infestation centres is now being obtained. As a result a double aeroplane-dusting campaign is now in progress, one aspect dealing with general commercial dusting and the other with attempted control of a cycle through the treatment of initial centres of infestation. Incidentally, benzene hexachloride appears to be somewhat better than cryolite and is being tested with a view to ascertaining whether a change of insecticide will yield better practical control. A detailed study of the biology of the wattle looper has been prepared for publication. As regards jassids, a detailed study of the possibilities of resistant strains of wattle has been commenced in co-operation with the Wattle Research Institute.

Timber Pests.

The European house-borer, *Hylotrupes bajulus*, has been receiving greatly increased attention at Cape Town and Port Elizabeth. Surveys at both centres, although not far advanced, are divulging very serious losses and large-scale infestations in certain areas. Regulations have been promulgated for the purpose of checking these infestations, both in local and national interests, but for practical reasons these regulations have had to be revised and should soon be in force in their new form. In the meantime, there have been many hundreds of calls for inspection and advice, not only from private house-owners but also from timber firms, timber preservative firms, private building concerns and national housing schemes. Work on the biology of the pest is steadily proceeding, as also work on chemical methods of control, whilst a brief visit by the Chief of the Division to Sweden has made available valuable European information on the biology and control of this insect. In this connection it may be mentioned that Sweden has developed a new system of heat treatment for infested buildings and this method is so promising that units of the apparatus required have been ordered and should shortly be available for local trial.

Powder-Post Beetle (*Lyctus brunneus*).—Although hundreds of applications for advice are still being received, it is clear that the general incidence of the pest is already on the wane. On the whole, trouble is still largely confined to certain very susceptible species of timber which came into wide use during the war. The local pine timber borer, *Oxypleurus nodieri*, has definitely been found

in a number of cases of damage to sawn and cured pine timber, in circumstances very similar to typical cases of *Hylotrupes*. The damage, however, generally appears to be less intensive and extensive in character.

The furniture beetle, *Anobium punctatum*, proves to be more widely distributed and is definitely doing very serious damage at both Cape Town and Port Elizabeth. An Ipid beetle, as yet unidentified, appears to be almost as troublesome in Cape Town as *Anobium*.

Field Crop Pests.

Maize Stalk-Borer (*Busseola fusca*).—During the past season, which was characterized by severe outbreaks of stalk-borer in areas where early planting of maize had been possible, much intensive attention was given to circumstances governing the effectiveness of a top-dressing treatment. D.D.T. powder gave excellent results at a very low cost, both for application and material, and a close study of the problem has led to the conclusion that, whilst very gratifying results can be obtained by treating infested plants only, the additional advantages gained by treating all plants in a field at the right time are such as to merit very serious consideration of the advisability of general treatment despite the somewhat higher cost.

Cutworms.—The main species prevalent over the eastern Orange Free State proves to be *Euxoa segetis*, to the biology of which detailed attention has been given over the past year at the new out-station at Bethlehem.

Sweet-Potato Pests.—In Pretoria an outbreak on sweet potatoes of two successive generations of potato sphinx moth, *Herse convolvuli*, was effectively controlled by dusting with calcium arsenate, while at Nelspruit outbreaks of the sweet-potato weevil, *Cylas compressus*, were effectively controlled with 5 per cent. D.D.T. dust.

Lucerne Caterpillar.—Severe outbreaks of the lucerne caterpillar, *Colias electo*, particularly in the Kimberley and Upington areas during the 1945-46 droughts, occasioned serious concern. After field trails, natural cryolite proved to be the most desirable and effective insecticide to use.

Eelworm.—Amongst tobacco pests eelworm received particular attention. Silver concentrations for seed-bed treatment are still promising, but the results were seriously obscured by the unexpected incidence of bacterial disease in beds.

Potato Tuber Moth (*Phthorimaea operculella*), was effectively controlled by dusting calcium arsenate or cryolite at the rate of 25 lb. per morgen; 5 per cent. D.D.T. powder also gave satisfactory results and was found to control potato thrips as well as tuber moth. Centipedes were also successfully controlled by baiting.

Chicory Pests.—In the Alexandria district these have been demanding considerable attention. The main damage appears to be done by a species of weevil as yet unidentified. As a preliminary measure 5 per cent. D.D.T. dust in talc has given very encouraging results. Pest incidence in chicory appears to be intimately tied up with inadvisable crop practices over a series of years.

Vegetable Pests.

Onion Thrips (*Thrips tabaci*). — D.D.T. sprays proved to be effective against this pest and appeared to improve results, but the maintenance of soil fertility still appears to be the more practical method for the control of this pest.

Cabbage Moth (*Plutella maculipennis*), yielded readily to control by the application of both calcium arsenate and D.D.T. powder, but the actual time of application proved to be of the utmost importance.

American Boll Worm (*Chloridea obsoleta*), which is a common pest on many vegetables and also fruits, responds to treatment with 5 per cent. D.D.T. powder, but is evidently much more resistant to this insecticide than other species of caterpillars.

Soil Pests.

In the past two or three seasons soil pests have come to be of ever-increasing importance and have proved responsible for a degree of damage not previously recorded in the country.

Amongst the more important are *Astylus atromaculatus*, more commonly known as pollen feeder, and troublesome mainly on garden flowers and on maize tassels. Recently, however, the larvae of this insect have caused severe damage to stems of field crops such as maize.

Heteronychus arator, generally known as the black maize beetle, has also proved to be of wide-spread importance in certain centres, particularly in the maize belt. Both the larvae and adult beetles damage the young stems and the seeds at germination time.

Associated with *Heteronychus* are a species *Adoretus* doing the same kind of damage, and, at times, the larvae of wireworms (unidentified), whilst millepedes have been causing much damage, particularly to potatoes.

It is evident that the control of these pests will have to be very seriously considered. The field, however, is relatively new for the Union and a great deal of biological work will be necessary. Fortunately, some of these pests at least have responded favourably to treatment of the soil with the newer insecticides such as D.D.T. and gammexane powders, and work along this line is proceeding.

Plant Nematodes.

The most troublesome species in this field is *Caconema marioni*, or root-knot nematode, to which a large amount of experimental work has been devoted at a number of centres, particularly Brits, Rustenburg and the Vaalhartz Irrigation Settlement, in co-operation with the Division of Animal and Crop Production. Most of the experiments are of a long-range nature, involving in particular, soil fertility, the employment of organic matter in the soil and crop rotation. Some of the more important of these experiments are now beginning to yield results. The actual value and volume of these data, however, will increase with every year that passes. The Division is also co-operating with the irrigation settlement authorities in the practical appraisal of various farming systems for different areas selected with a view to minimizing the effect of eelworm on the long-range farm-practice basis. The specific trials near Pretoria have indicated that judicious variation in the time of planting potato crops in the hotter areas, particularly with a view of evading extreme high temperatures during the time of crop growth, can be used with very definite effect towards reducing eelworm infestation in the resultant crop.

Pasture Pests.

In the effort towards establishing the possibility of controlling Karoo caterpillar, *Loxostege frustralis,* by means of imported parasites, nine species of parasites are now available and the technical staff at Grootfontein is being expanded for the purpose of breeding and liberating these in larger numbers than has been possible up to the present. The project is particularly vulnerable in as much as erratic rainfall very strikingly affects host incidence, a fact which makes it difficult to anticipate with any exactitude the number of parasites that should be provided at any particular centre. Furthermore, some of these parasites can be bred only on the larvae of *Loxostege,* which are difficult to handle, and, therefore, the production of parasites is necessarily very slow. Various liberations have, however, been made over the past season and further systematic liberations are planned for the present summer.

Dassies. — Investigations over the past two years have given definite indications—

(1) that serious damage to grazing is closely bound up with degree of depletion of grazing from other causes;

(2) that, whilst the actual numbers of dassies in any locality are often high, the breeding potential of the animal is really quite low, amounting to a litter of three per year per adult female;

(3) that shooting, trapping and hunting with dogs offer very definite possibilities towards strongly reducing local populations, provided that such operations are systematically planned and thoroughly executed;

(4) that, although the depletion of predatory enemies of the dassie may possibly have a strong bearing on present populations, the problem seems to be definitely approachable along the lines indicated above; and

(5) that the market for dassie pelts, theoretically available and in recent months more definitely indicated by the fur trade, could probably be exploited towards counterbalancing the cost of destruction or perhaps even be turned to positive gain.

It has not been possible to accord full-time attention to this project, but further investigations are proceeding as staff facilities permit.

Harvester Termites (*Hodotermes* spp.).—Damage to grazing has been very acutely felt during the recent drought periods. The Division is of the opinion that the methods of combat available could prove of great practical use to farmers concerned, particularly if arrangements were made for having these methods explained and demonstrated.

Mound-Building Haymakers (*Trinervitermes havilandi*).—Under the relatively dry conditions and acute shortage of grazing just referred to, the depredations of these common ant-heap termites have become much more conspicuous. There is no doubt that in certain areas local populations have been shown to be very high and, both by virtue of the space occupied by the mounds and by actual destruction of the sparse vegetation, do much to accentuate the grazing shortage. In fact, the indications are that drought conditions definitely favour the multiplication of mounds and militate against the natural decrease of populations attendant on wet conditions. Special attention has been paid to control measures heretofore not definitely formulated for the species and up to the present the indications are that the pest can be brought

under control by a combination of mound destruction and poisoning methods at a cost of about 1s. 6d. per morgen. Incidentally, it has been established that the parasitic fly, *Stomorrhina cribrata*, breeds in the nests of *Trinervitermes* and is almost undoubtedly one of the main factors causing the extermination of colonies of these termites in nature.

Fungus Growers.—These include a number of species, all of which normally feed on waste grass or other vegetable matter and automatically tend to destroy useful elements in grazing when waste cellulose food is at a premium. Work on control measures for these species is proceeding, as is indicated in the following sub-heading.

Termite Damage to Buildings.

The main species involved are *Macrotermes natalensis, Macrotermes bellicosis, Odontotermes badius, Termes latericius, Allodontermes schultzei* and *Microtermes havilandi*. In the efforts to combat the larger and more troublesome fungus growers in and around buildings, attention has been given to the improvement of methods for destroying colonies. In the first place, the old arsenic and sulphur method has been improved in the mechanism of application in as much as pressure applied by means of a power-driven mechanism works more quickly and more efficiently. Secondly, various other methods and particularly methods based on the use of the newer insecticides, namely D.D.T. and benzene hexachloride, have been tested in various ways. Briefly, dusts have been rather unsatisfactory because of uneven distribution and repellent effect within the nest. Smoke-borne forms of D.D.T. and benzene hexachloride, on the other hand, are in general very promising. For the application of these, recourse has been had to the employment of several types of smoke bomb, in the use of which a special container for the bomb, consisting essentially of a suitable shaped air-tight metal container, has been substituted for the old air-pump plus furnace arrangement used for the application of arsenic and sulphur fumes. These methods are extremely promising and considerable benefit from the point of view of speed, efficiency and cheapness is expected from their ultimate use. In the practical application of termite-control measures in buildings, active co-operation has been established with various bodies concerned in large-scale building in the country, including the Public Works Department and the Natal National Housing Sceme.

Army Worm.

Special investigations during the actual outbreak, and also several months prior to this, as well as during the winter following last season's outbreaks, have added considerably to our pertinent knowledge of the pest. In the first place, attempts to locate either winter or early summer breeding centres from which the mid-summer and late summer infestations usually appearing from late January to March could directly arise, have not been successful. Although the possibility of success in this direction is not finally excluded, it is evident that for the present the only practical course would be to maintain vigilance at all vulnerable centres and to institute immediate control operations when outbreaks arise. In other words, apart from inferences to be drawn from climatic and pasture or crop conditions, it is not possible to predict invasions. We can, to a certain extent, by inference predict the possibility of local outbreaks, but any campaign planned must, of necessity, depend on outbreaks actually reported. As outbreaks are, as a rule, not

reported by farmers until they are two or three weeks old, the average situation leaves no time for planning once the intelligence is available. Long-range planning, however, is not only possible and feasible, but seems indeed to be the most feasible method for dealing with this pest. In the nature of the case the individual farmer and farming communities as such are best fitted to maintain the necessary vigilance. Although assiduously maintained observation is essential for this purpose, this is not beyond the capacity of any farmer, as incipient outbreaks, both in cultivated fields and grazing, show up as patches, perhaps slightly but nevertheless distinctly differing in appearance from the rest. At this initial stage the army worms are still very young and concentrated, and under these conditions not only is the area involved relatively small, but the insects are much more vulnerable to insecticides than in their later stages. Experience and trial over the past season has again demonstrated the fact that the application of suitable insecticide dusts at this stage constitutes an effective and economic remedy. Naturally, for crops such as oats or teff a higher cost is justified than for the same area of grazing. Even in the latter case, however, the potential range of a moving local army of caterpillars renders a considerable cost justifiable even on ordinary grazing. As a temporary guide it may be quoted that 20 lb. of dust per morgen, obtained at a cost of, say, 10s., produce highly satisfactory results if applied in good time. Among the dusts available 5 per cent. D.D.T. is outstanding for all caterpillars up to the fourth stage, but natural cryolite is somewhat more dependable for fifth and sixth stage caterpillars. At present there is little difference in the cost. The apparatus required is a dust-blower, preferably of the rotary type, and normally costing somewhere in the range of £6. It is felt that by timely organization, from the point of view both of vigilance and of obtaining the necessary equipment for any given community, farmers could, with a measure of guidance from the Department, readily prevent most of the damage annually suffered. A particular recommendation is that army worm control be made a voluntary community task and that farmers' organizations be extensively made use of, both in the planning and execution of the control work, but particularly for timely purchase of the necessary insecticide and equipment, preferably on a co-operative basis. Recommendations to this effect have already been issued.

Flower Pests.

Among the pests which have come in for particular attention over the past year are carnation thrips, which was very successfully controlled with 5 per cent. D.D.T. dust; carnation worm, which was successfully controlled with calcium arsenate; red spider, which did not respond to sulphur and lime sulphur treatment but against which one of the newer insecticides of promise was tried; white-fly on greenhouse or stoep plants; and *Protostrophus* weevils and mealy bug on ferns, which respond satisfactorily to D.D.T. treatment. Much time has been spent on giving advice to various flower farmers around Pretoria and Johannesburg, where floriculture is a profitable undertaking.

Parasite Laboratory.

Besides handling the introduction of various parasites and other useful insects from overseas, this section is entrusted with the basic study of pests in relation to natural control factors.

Besides routine work, therefore, a vast amount of investigational work is required, for which the staff available is entirely inadequate, as also the housing facilities. Among the more important studies undertaken or completed during the past year, the following may be briefly mentioned. Blow-flies have been studied in the laboratory to gain sound information on the subject of exact relationship and competition between the various species involved, and the following conclusions have been arrived at:—

(1) The *Lucilia* species are in every way the most successful of our blow-flies and this is evidently why they are always so numerous.

(2) Competition is limited to seasonal representatives essentially and it is seldom that all four species enter the picture together.

(3) *Chrysomyia marginalis* is not predacious, nor does it seem otherwise fitted to control the numbers of *Lucilia* on carrion.

(4) The increase of field populations is dependent on factors outside the blow-fly complex itself, namely the increase of available carrion.

(5) It is competition which is responsible for the violent fluctuations in blow-fly populations, peaks being represented in practice by so-called bad fly-years.

(6) Competition, therefore, does not have an economically satisfactory result. Carcase destruction is sound in principle, but too inefficient in practice.

(7) The use of natural control factors renders essential much more detailed knowledge of the flies in relation to the whole of their environment. Some restoration of a natural balance is clearly needed.

Incidentally it was shown that the pupation habits of different species have a very important bearing on their natural protection against parasitism, and much new experimental evidence has been gained on the interaction between blow-flies and their parasites.

Insect Population Studies.

Ephestia kuhniella.—This insect is used in the mass-production of various parasites bred for field liberation. In an effort to improve the efficiency of such production, it has been demonstrated that oviposition is directly dependent on the density of moth population per given area of oviposition medium; that the number of eggs is dependent on the size of the female; that the size of the female again is dependent on the larval density in the medium; that the mortality of larvae in this medium is also directly proportional to the population density and that the size and vitality of individuals are also governed by the suitability of the medium.

In comparing two different parasites on the same host, namely *Microbracon hebetor* and *Chelonus texanus*, a difference in the hunting habit of two parasites was shown to exercise vastly different results in the final degree of parasitism achieved in each case.

Codling Moth.—At Pienaarspoort near Pretoria a promising local parasite complex for codling moth has been shown to exist and every effort is being made to study the possible utility of this complex in conjunction with judicious spraying. Already doubt has been cast on the usefulness of the early sprays in view of the

balancing effect of egg parasites later in the season and it seems likely that fewer sprays in conjunction with parasite effect will produce equally satisfactory results.

Natural Control of Red Scale.—This subject is being given attention as opportunity arises, but particular detailed attention has been paid to the situation at Letaba Estates, where an exceptionally well-balanced combination of parasites is available. This complex is locally so successful that the possibilities of its wider use under judicious guidance are being investigated.

A number of reports and articles of a highly technical nature in this field of work have been published or prepared for publication.

Tsetse-Fly.—At the invitation of the Director of Veterinary Services, the Division has collaborated in the tsetse-fly campaign (*Glossina pallidipes*) at the Mkuzi Game Reserve. Apart from matters arising out of mutual interest in the insecticides employed and in the technique of spraying, the Division's share in the project consisted of attempts to ascertain the fate of the natural insect fauna of the sprayed area as a result of the spraying. It was unfortunately impossible to prepare the ground by a really thorough survey of the insect fauna, but it was nevertheless possible to obtain a fair idea of the representation of most insect families and to get some idea of the mortality caused by spraying. Briefly, the spraying employed was of so low a concentration that very large numbers of species did not appear to be affected at all, but in all families there were apparently species particularly susceptible and these were decimated in very large numbers. Thus far, however, no signs have been observed of very serious upsets in the general balance of these populations and the indications are that as the area is relatively small, natural influx from outside the treated area would probably soon restore normal conditions. A detailed report will, however, not be possibe for a very considerable time; as thousands of species are involved and particularly as these are in general not insects thus far recorded as of economic importance, identification will be a very slow task. Incidentally, a mass of valuable experience has been accumulated on the technique of application for sprays and smokes from the air and on the desiderata of the insecticides for such a purpose, as well as the organization of such a task.

Insect Vectors of Plant Diseases.

Efforts along these lines have still been confined to general assistance towards the maintenance of potato seed against virus diseases and to the vector aspect of kromnek in tomatoes and tobacco. The system of double-planting, which has been advocated for a year or two, is being followed as a practical measure against the incidence of the disease in tomatoes. It has also been practised to some extent in tobacco, in which connection, however, there is as yet no complete certainty as to the final quality of the crop as a result of thicker planting. General indications are, however, favourable and this point is being finally tested by the Division of Agricultural Education and Research.

Apiculture.

The Italian queen-bee service is being maintained, though necessarily at a reduced rate on account of the difficulty of obtaining technical staff. The interest in organization amongst beekeepers has shown a definite increase, with the result that five beekeepers'

associations have now been established. The brood-rearing study designed to ascertain the natural fluctuation of hive populations in various areas is still being maintained in several centres. Over nine hundred letters from beekeepers were handled over the period under review and short courses were given at Pretoria, Potchefstroom, Stellenbosch and Cape Town.

Insecticides.

Whilst the main activities under this heading have been conducted by the newly-established section in Pretoria, numerous confirmatory or additional tests have also been carried out by the various out-stations. Much attention has been given to the problem of standardizing D.D.T. products in collaboration with the South African Bureau of Standards. As part of the functions of the section approved experimental dusting apparatus and technique have been developed for the purpose of applying insecticides in dust form accurately and uniformly to a given surface area. The same has been done in respect of liquid sprays. These units have been used extensively towards the standardization of knock-down and residual sprays. In the latter connection, it has been ascertained that residual effect is very strongly influenced by the nature of the surface itself. For instance, unpainted wood, painted wood, distemper, glass, slate and cement differ vastly as to the practical value of the residual spray both shortly after and a month or more after the application. Investigations are proceeding. Incidentally, the inclussion of D.D.T. in distemper does not appear promising from the practical point of view. Much difficulty has been experienced in obtaining satisfactory emulsions of D.D.T. An effective imported emulsifier is not readily available and as a substitute a suitable mixture of extraction naphtha and turkey-red oil was eventually found satisfactory. Some work was also done on synergons for D.D.T. in sprays. Amongst these 5 per cent. ethylene glycol ether was found to be particularly promising. Sesame oil as an activator proved variable in grade and in action. In the course of the year numerous biological tests were carried out towards the standardization of various spray materials. Numerous tests on individual insect pests were carried out, amongst which the following are of special interest:—

Against cochineal, *Dactylopius opuntiae* a 2 per cent. D.D.T. emulsion gave very promising results and a residual effect of two months. It is, however, expensive for use on a field-scale.

Against army worm, *Laphygma exempta*, tests were carried out with 5 per cent. D.D.T., 5 per cent. benzene hexachloride, natural cryolite, calcium arsenate and sodium fluosilicate. The first two mentioned were excellent for larvae up to the fourth instar; after that cryolite and sodium fluosilicate were superior, but as sodium fluosilicate is phytotoxic, cryolite remains the first choice for the present. Calcium arsenate gave inferior results.

On bagworm, *Acanthopsyche junodi*, both 5 and 10 per cent. D.D.T. were much inferior to cryolite, whilst 5 per cent. benzene hexachloride proved somewhat more toxic than cryolite.

Against bagrada bug, *Bragada hilaris*, 5 per cent. D.D.T. gave good results, and 5 per cent. benzene hexachloride was better, giving a quicker and higher kill, but pyrethrum was unsatifactory.

Against wattle jassid, *Bythoscopus cederanus*, and wattle capsid, *Lygidolon laevigatum*, 5 per cent. D.D.T. was fairly good, but was inferior to 5 per cent. pyrethrum.

Against cabbage caterpillar, *Plutella maculipennis*, 5 percent. D.D.T. gave excellent results and proved superior to cryolite.

Against eucalyptus snout beetle, *Gonipterus scutellatus*, D.D.T. proved superior to cryolite, benzene hexachloride and calcium arsenate for the control of adults, but not so effective against the larvae.

As a soil insecticide against *Sciobius granosus* D.D.T. proved quite ineffective, giving only 30 per cent. kill at a concentration of 1 per cent. as against 100 per cent. kill for pentachlorophenol at a concentration of 0·36 per cent.

Against tsetse-fly, *Glossina pallidipes*, in laboratory tests a 5 per cent. D.D.T. dust at the rate of 10 lb. per acre, gave a complete knock-down within four hours and 100 per cent. kill within twelve hours.

National Collection of Insects.

The space for the collection has been slightly improved, but is still far from satisfactory. In the period under review a number of identifications have been made for individuals and institutions outside the Union, mainly in the African Territories, and much time has been given to the preparation of material from the Mkuzi tsetse spraying experiment. Identification work by the Imperial Institute of Entomology in London has commenced to take shape again and over the past year nine consignments were despatched for identification. Research work on Trypetidae and Curculionidae by members of the staff has proceeded. Amongst the records of pests, apart from *Locustana pardalina* which is referred to elsewhere, the following species should be specially mentioned:—

(*a*) *Laphygma exempta*, army worm; severe outbreaks occurred in the Dundee-Vryheid area, as also in the Swaziland lowveld and Portuguese territory south of Lourenco Marques. Small, isolated outbreaks occurred in the Pietersburg area and also in the Transvaal highveld.

(*b*) Maize stalk-borer, *Busseola fusca*, caused severe damage in various portions of the maize belt.

(*c*) *Astylus atromaculatus* and *Heteronychus arator* caused severe damage on portions of the highveld, the latter insect doing particularly severe damage to potatoes in the soil.

(*d*) Wattle bag-worm was seriously on the increase in parts of the wattle areas.

(*e*) The pine tree caterpillar, *Nudaurelia cytherea*, caused severe damage to pines in various parts of the western Cape Province.

Amongst the records of pests of less economic importance may be mentioned *Mesoscelis montana*, a hairy caterpillar occurring in the Karoo and apparently a very important potential pest of grazing in that area; an unidentified hairy caterpillar from Maclear, where serious damage to grasslands is reported; *Dalaca rufescens* from Pretoria; *Tylococcus chrysocomae* on bitter Karoo (generally mistaken for cochineal on Karoo veld); *Nudaurelia belina* on Mopani in Bechuanaland and the Northern Transvaal; and *Meliana exul*, identified as a serious caterpillar pest of potatoes in Tristan da Cunha.

Horticultural Services and Research.

F. G. Anderssen, B.Sc. (Agric.), Ph.D., Chief of the Division of Horticulture, Pretoria.

THE activities of the Division of Horticulture essentially concern all horticultural crops such as fruit, vegetables and flowers, and can be divided up under the following three headings:—

(*a*) Advisory Work;
(*b*) Research; and
(*c*) Inspection and Control.

A. Advisory Work.

Most advisory work is entrusted to special officers allocated to this work, who are also required to do a certain amount of research work, but their first duty is to attend to enquiries from farmers by correspondence or by visiting farms or by addressing farmers' meetings. These officers are stationed in various parts of the Union, as for example, at Pretoria, Nelspruit, Bathurst, Port Elizabeth, Joubertina, Oudtshoorn, Stellenbosch, Vaalhartz, Upington and Potchefstroom, and deal with all queries from their particular areas.

During the year under review about 2,600 farms were visited, and over 14,000 letters were written and 22 articles published by officers of the Division. Furthermore, nearly 4,000 visitors called at horticultural stations for verbal advice, and officers addressed 21 farmers' meetings which were attended by a total of over 1,300 farmers. These figures do not include the correspondence by the staff devoted essentially to research work, nor the visits to farms by research officers in connection with their research projects. The activities of the fruit inspection section are also excluded from the above figures.

The demands being made on this advisory service are so great that the existing facilities cannot cope satisfactorily with the requirements of the farming public.

B. Research Work.

There are many research projects which cannot possibly be mentioned in such a short report as this. The general field of investigation only is therefore indicated and the most important immediate results are reported specifically.

Research work is carried out by officers stationed at the horticultural offices at Port Elizabeth, Joubertina and Stellenbosch and at the following stations, namely:—

Pretoria Horticultural Research Laboratories,
Onderstepoort Vegetable Research Station,
Nelspruit Sub-tropical Horticultural Research Station,
Bathurst Pineapple Research Station,
Oudtshoorn Vegetable Research Station,
Vaalhartz Experiment Station, and
Upington Experiment Station.

Citrus.

Nutritional Studies.

(*a*) The main citrus fertilizer project at the Nelspruit Research Station, referred to as the "Long-Term Project" or "Permanent Fertilizer Project", has yielded significant results for the fourth year in succession, namely:—

(i) ammonium sulphate decreased the yield, the fruit size and the juice content, and increased the acidity and rind thickness of Valencia oranges;

(ii) superphosphate and kraal manure produced the opposite effect, having increased the yield, the fruit size and the juice content; and decreased the acidity and rind thickness of the fruit; and

(iii) potash fertilizers increased the acidity of the fruit.

Thus, on the sandy soil on which this experiment is being conducted, the limiting factor for the first twelve years of the life of the citrus trees has been phosphates.

It is already evident that with an increase in the age of the trees, nitrogen will become the next limiting factor, and no doubt in the next few years the need for nitrogen application will become more evident.

Notwithstanding the lack of positive results with nitrogen applications to date, the orchard in question is one of the finest to be seen anywhere, and the average yield of 508 lb. of fruit per tree for 2,100 trees, with the top average yields of 767 lb. per tree for the best treatments, may be regarded as exceptional in the world for twelve-year old trees.

(*b*) In a supplementary citrus fertilizer experiment on the Nelspruit Research Station, with trees planted in January 1935, ammonium sulphate, calcium nitrate, nitro-chalk, kraalmanure plus nitrochalk, in each case plus potassium in the form of potassium sulphate, are tested out against a superphosphate plus potassium sulphate "control" under two systems of cultivation, namely, clean cultivation and green manuring. In this experiment the results with regard to the crop are similar to those obtained in the "Permanent Experiment". Nitrogenous fertilizers do not seem to be essential for growth, yield and quality of fruit during the first twelve years after planting.

(*c*) In certain investigations being conducted near Rustenburg in the western Transvaal, the form in which nitrogen is applied to citrus trees has been shown to be very important. Although nitrogen in the form of ammonium, such as ammonium sulphate, is the usual nitrogenous fertilizer used, this form of nitrogenous fertilizer may, under certain conditions, have a very deleterious effect on the growth of citrus trees, while the size and the quality of the crop is also adversely affected, the acid content of the fruit being very high and the rind excessively thick.

In the western Transvaal many instances have been found where nitrification of the ammonium to nitrate in the soil is exceedingly slow. In such cases the ammonium ion as such is rapidly absorbed by the tree to the detriment of the tree and crop. Furthermore, the soils in question are naturally poorly supplied with bases, with the result that the ammonium nitrogen actually leaches out easily, contrary to the usual accepted theory which assumes that ammonium nitrogen is not leached out of soils. Where ammonium sulphate is used as a source of nitrogen in such soils, lime should be added to the soil prior to the application of ammonium sulphate. Alternatively, it is much safer for growers to use artificial nitrogenous fertilizers containing nitrogen in the form of nitrate, e.g. nitrate of soda or calcium nitrate.

The influence of the absorbtion of large quantities of ammonium nitrogen by citrus trees is also being studied in sand and water cultures under controlled conditions. The ammonium ion has been shown to have deleterious effects on the absorption of other ions necessary for normal plant growth, and also to retard root growth very markedly.

(*d*) Very considerable progress has been made with the development of a technique for analysing citrus leaves with a view to

diagnosing nutritional requirements, with the result that there is reason for optimism regarding the eventual use of this method for quickly determining the fertilizer requirements of citrus trees. This method has already made it possible to diagnose successfully various nutritional problems.

(*e*) There are many smaller research projects dealing with citrus nutrition which need not be commented on here or mentioned in detail, but a few of these include:—

(i) the examination of the cross-transfer of solutes from one side of citrus trees to the other;

(ii) sand and water culture experiments dealing with physiological and nutritional problems of citrus;

(iii) biological studies of citrus roots;

(iv) organic *versus* inorganic fertilizers; and

(v) the importance of trace elements under various soil and climatic conditions, etc.

Root and Rootstock Investigations.

(*a*) Past reports have indicated the large-scale and comprehensive citrus rootstock projects which are under way. The main consideration at present arising out of the citrus rootstock projects is that of the rough lemon stock *versus* the sweet orange stock for new commercial citrus plantings in the Union. This is of particular importance as large-scale replanting programmes have been started on various citrus estates with a view to replacing the very large numbers of citrus trees in the country which are reaching an unprofitable age.

The results from rootstock experiments started fifteen years ago may be summarized for all citrus varieties as follows:—

Sweet Orange Stock—produces a higher quality fruit right from the first crop, with significantly higher soluble solids and acid content of juice. The fruit tends to have more juice, thinner rinds, and a slightly higher T.S.S.: acid ration. It is expected that the trees will live much longer in good health, and that the fruit will hang on the tree in good condition. Incidence of "greening" is only from half to less than with rough lemon stock.

Rough Lemon Stock—far less trouble to propagate tree in nursery; it can withstand greater adverse conditions after lifting from nursery; it comes into bearing earlier, and up to sixth year of bearing should produce up to 25 per cent. more fruit; the difference in the eighth year is approximately 15 per cent. Fruit size is larger, particularly in early years. Many growers who are interested in improving the quality of South African citrus, and particularly those in areas where difficulty is experienced in meeting the standards for export, are using trees on sweet stock for their new orchards, being prepared to forego the difference in yield.

Results from most of the 56 citrus rootstock plantings continue to indicate that the time will come when specific rootstocks may be used for different citrus fruits and also for different soil types. Such new stocks as tangelo and mandarin for grapefruit and mandarin for Jaffa orange types are showing their inferiority over sweet orange and rough lemon for both of the desirable factors of yield and fruit quality.

The performance of such minor citrus fruits as naartjies, limes, citrons and kumquats on rough lemon, the only stock used for them hitherto in the Union, has been unsatisfactory, but among the 36 stocks to which these sorts have been budded there are certain

stocks which will result in the successful propagation and growth of such citrus species.

(*b*) Other citrus root studies have shown that subsequent growth of the tree is very materially affected by the condition of the root system at the time of lifting from the nursery. Under certain soil conditions a well-developed lateral root system appears to be very desirable in contrast to a very marked tap root system where lateral roots are nearly non-existent. Nursery practices and methods of fertilizing nursery trees are being investigated, and observations on severity of root pruning, closeness of planting and frequency of irrigation are also being made.

Water Relationships.

Large-scale projects dealing with irrigation practices and their influence on nutrition and general cropping are under way. The trees being used have been propagated specially for the purpose and are of the same parentage and as uniform as possible. Results of great practical value are expected from these investigations, but specific results are not yet available for publication.

Breeding and Selection.

All possible varieties and species of citrus trees are imported from all over the world. As a result, the citrus variety orchard at the Nelspruit Research Station now contains approximately three hundred varieties and species of citrus. Not only are these varieties being testsed out under different climatic conditions in South Africa, but the plant material is also available for the purpose of breeding and selecting new and better varieties. So it has already become evident that there are a large number of different strains of the Navel variety of orange grown in the Union; some of them differ so much in quality and characteristics that they could justifiably be given different names.

Other Sub-tropical Fruits.

(*a*) The production of sub-tropical fruits, other than citrus, forms a very important industry, the value of the fruit produced being estimated at between one and two million pounds. The various variety orchards of avocados, mangos, litchis, pecans and miscellaneous fruits in which the possibilities of leading varieties of the different fruits imported from all over the world are being tested out, play a very important rôle in the present rapid development of sub-tropical fruit plantings. The limiting factor in the commercial planting of those varieties which have already been shown to be superior to the existing varieties grown, is mainly that of shortage of propagation material. After three years of extensive trials, the technique of vegetative propagation of the mango has now enabled the Sub-tropical Horticultural Research Station at Nelspruit to have the first known mango nursery of budded trees in the Union, and distributions of improved mango varieties have already been made.

The variety orchards include approximately 60 varieties of avocados, 70 of mangos, 30 of litchis, 40 of pecans and many miscellaneous fruits.

(*b*) The variety collections mentioned are also to be used in connection with the breeding of new and improved varieties of fruits. The first outstanding new fruit variety produced at the Nelspruit Research Station is the "Hortus Gold" variety of papaw. It is now in commercial production and in great public favour because of its outstanding qualities.

(c) *Tung Nuts.*—The rootstock trials with *Aleurites Fordii* and *Aleurites Montana* have largely substantiated the results reported on earlier.

All Montana treatments outyielded all Fordii treatments.

The Montana trees budded on Montana rootstocks gave on an average about four times the average yield of the two Fordii selections.

The crops of the Montana seedlings have increased surprisingly, especially if it is taken into consideration that half the trees in this treatment are predominantly male.

The Fordii seedlings outyielded the same strain of Fordii when budded on Fordii rootstock and this again outyielded Fordii budded on Montana rootstock.

The Montana seedling trees, which happen to be predominantly female, produced crops as large as those of the Montana trees budded on Montana rootstocks.

Vegetable Production.

A special section has been established within the Division for the purpose of dealing particularly with vegetable-production problems. Many nutritional, varietal and other investigations have been commenced recently, so that it is unnecessary to report progress at this stage. The activities of the Division in the field of vegetable production are expected to expand rapidly. A few projects which have already produced tangible results may be indicated.

Nutritional Problems.

(a) Chlorosis of spinach and lettuce is a common malady on the Transvaal highveld and middleveld. Investigations have so far shown that the malady is due to a high pH of the soil and an excessive concentration of brak salts.

(b) In connection with beet seed production, a serious problem was introduced by the fact that standard germination tests in incubators, showed a very low percentage germination, whereas soil tests showed a much higher percentage germination. Investigations proved that the beetroot seed contained a high percentage of nitrogen in the form of nitrite. The nitrite nitrogen in turn is toxic to very young seedlings, and therefore killed the seedlings in the standard germination test, hence causing a low percentage germination. When the nitrite is thoroughly washed out of the seed by continuously flowing water for a period of twelve to twenty-four hours, then the standard germination test showed a satisfactory percentage germination of the seed. The problem is being thoroughly investigated in order to determine what nutritional conditions in the field have caused the production of the high percentage of nitrite in the seed.

(c) Tests in connection with thrips on onions have been carried out in co-operation with the Division of Entomology to determine a practical method of combating this pest. It has been found that top-dressings of inorganic nitrogen fertilizers, causing vigorous growth of the young plants, made it possible for the plants to withstand thrips attack without the necessity for expensive spraying.

(d) Weed control, which is a very important factor in the nutrition and growing of vegetables, is being investigated by using various chemicals.

Other Growth Problems of Vegetables.

(a) Samples of all vegetable seeds produced in the Union on a commercial scale are grown in test plots and are compared with one another and also with samples of imported seed. This procedure not only makes possible a comparison with the yield and quality of

imported seed, but also enables the plant geneticists to know where or whether improvement is necessary in the production of mother seed. Such trials are carried out in several different areas under different climatic conditions of the Union.

(*b*) The control of eelworm in the soil by chemical methods is being investigated in co-operation with the Division of Entomology.

(*c*) Mulching and irrigation trials in connection with the germination of seed and the production of vegetables are also being carried out. The necessity for protecting seed-beds during hot weather has become evident.

(*d*) In regard to bacterial diseases of beans and cabbages, various investigations are being conducted in co-operation with the Division of Botany and Plant Pathology with a view to their control. These diseases are carried by seed and the disinfection of seed is therefore a very important commercial necessity.

Breeding and Selection of Vegetables.

(*a*) At present these investigations are confined mainly to the inbreeding of carrots, beetroot, spinach beet, tomatoes and egg-fruit in order to determine:—

(i) The length of period over which inbreeding can take place without seriously affecting quality—a matter which affects the Divisional policy laid down with growers who produce seed commercially by rigorous selection;

(ii) how the most important characteristics are inherited.

Furthermore, the breeding programme provides for making re-combinations of inbred lines with the object of maintaining or improving quality, uniformity and vigour. Already first and second generation inbreeding has made it possible to single out interesting types of carrots, spinach-beet, egg-fruit and tamatoes. Collections of many different varieties and variant types of carrot, beetroot and tomato have been built up with the object of securing from natural hybridization the greatest possible character combinations to commence a large-scale statistical plant inbreeding and re-combination programme.

(*b*) Several successful crosses have been produced with peas in order to obtain earlier and more suitable varieties for the semi-tropical conditions of the eastern Transvaal lowveld.

(*c*) Mother seed of beetroot, peas, tomatoes and Lucullus spinach beet has been produced on a limited scale and has been made available to seed-growers for commercial seed production. Ten lb. of such beetroot mother seed was distributed last season to commercial seed-growers and produced 10,000 lb. of good commercial seed.

(*d*) Breeding work with tomatoes at the Nelspruit Research Station has produced new strains which are absolutely immune to the bacterial wilt disease which causes havoc in the eastern Transvaal. Back-crossing and inbreeding is still progressing with a view to combining this immunity with a better quality commercial variety of tomato.

(*e*) Breeding work with cucurbits at Potchefstroom has progressed far towards producing standard quality pumpkins and squashes.

(*f*) In connection with the breeding of Hubbard squashes with a view to improving size of crop per plant, the Argentine native marrow has been found to be an excellent parent.

Certain plants have been segregated as a result of crossing which have the ability to bear fruit both on the stem and on the runners. Such plants have actually borne fruit on every node, so that more than one hundred female flowers have been counted on a single plant. This is something of very considerable interest when one takes into account the fact that the Hubbard squash normally bears no fruit on the stem and its first fruit on approximately the eleventh node of the runner.

Pineapples.

Investigations in connection with pineapples are conducted mainly in the Pineapple Experiment Station at Bathurst, but also at the Nelspruit Research Station and on a co-operative basis on the farms of commercial growers.

Nutritional Studies of Pineapples.

(*a*) The main fertilizer trials at the Bathurst Pineapple Station afford a great deal of interest to commercial pineapple growers. Considerable differences in growth and cropping are noted with different fertilizer treatments, notwithstanding the fact that commercial growers in the area generally claim that they can get no response from the application of fertilizers. As the plants reach a more mature age, the differences in growth and production are becoming more marked, and to date the fertilizer treatment involving the application of guano is giving the best results.

(*b*) Trace elements, particularly manganese, are being found, by leaf-analysis diagnoses, to be important in many pineries. Tests involving the use of manganese and other trace elements have recently been commenced.

Pineapple Selection and Breeding.

(*a*) Forty-six named varieties of pineapples are still under trial at the Experiment Station at Bathurst. Many of these so-called varieties which were imported are similar in every respect to the two common local varieties known as " Queen " and " Smooth Cayenne ". Of the imported " Queen " types, only the " Ripley Queen " shows promise of any superiority over the South African " Queen " pineapple. So far the Australian varieties of " Cayenne " (known as "Cayenne Zuill " and "Cayenne Q.A.S.") are bearing fruits with a single crown, this being a distinct improvement over the South African " Smooth Cayenne " variety which bears about fifty per cent. of its fruits with double or multiple crowns. Eighteen imported varieties have proved of no commercial value.

(*b*) The original selections of a superior quality strain of pineapple have been propagated and plants have been distributed to interested growers for trial plantings under different conditions.

(*c*) Many crossings between " Queen " and " Smooth Cayenne " have been made. The seedlings are growing both at Nelspruit and Bathurst and in due course new varieties will become available from these.

Deciduous Fruit.

Nutritional Studies of Deciduous Fruit.

(*a*) Large-scale fertilizer trials with a large number of varieties of deciduous fruit which are being conducted at the Vaalhartz Experiment Station, have continued to show the necessity for applying phosphatic fertilizers in those areas for normal growth. Whereas nitrogenous fertilizers induced no positive results in the trees for a number of years, the trees are now showing signs of lack of nitrogen. Both phosphatic and nitrogenous fertilizers have now become essential.

(b) Other fertilizer trials in the eastern Cape Province are still in progress but no startling results deserving mention at this stage, have been obtained. The necessity for the application of zinc to many trees in the Langkloof has, however, become evident.

Rootstock and Root Studies.

(a) The excavation of trees in the experimental orchards at the Vaalhartz Station have rendered very interesting data concerning the reaction of different rootstocks when budded to apricot trees.

Apricot trees on Marianna plum stock grew very much better than when budded on peach stock (Transvaal Yellow). The explanation for this appears to be the fact that invariably the Marianna root did not pentrate the soil deeply, and spread mostly in the upper 2 to 3 feet of soil, whereas the peach root penetrated through into the sub-soil, striking the lime strata lower down.

(b) Apple rootstock investigations at Potchefstroom with the variety Rome Beauty on three stocks, namely, Sweet Apple stock, Merton No. 793 and Northern Spy, have shown the following results:—

Trees on Sweet Apple stock are more vigorous than those on Merton No. 793, which in turn are again more vigorous than the trees on Northern Spy roots.

(c) Beurre Hardy pear trees on six different rootstocks and Bon Chretien on eight different rootstocks are being tested out in the Transvaal, in co-operation with the Western Province Fruit Research Station. Elberta peach trees, budded and grafted on five different stocks, are being studied at Potchefstroom.

Selection of Deciduous Fruit.

Various selections of the well-known Kakamas variety of canning peach have been planted out at the Upington Research Station for trial purposes. Not only is there a considerable difference in the various strains, but strains are now available which ripen at different times—a fact of particular commercial importance.

Viticulture.

Most of the viticultural work of the Division is done along the Orange River, with the Upington Research Station as its headquarters. Officers for advisory work on viticulture are also available at Pretoria and Oudtshoorn.

The main fertilizer project with sultana grapes at the Upington Research Station, has already made it clear that applications for phosphatic fertilizers and manure are desirable for best results in that area.

Floriculture.

Although much of the Division's advisory work has to do with commercial floriculture, relatively little serious research work is being done owing to a shortage of trained staff. One of the professional staff of the Division is now being sent overseas to specialize in the study of commercial floriculture and its problems. Amongst the relatively few investigations which have been conducted on commercial flower farms, fertilizer and irrigation methods have been found to be of very great economic importance.

As is also commonly the case with other horticultural crops to-day, trace elements are very important in the nutrition of many flowers. Physiological troubles such as "little leaf", mottling and chlorosis, due to deficiency of zinc or other trace elements, have also been found in flowers.

Seed Production.

The extensive programme for building up a seed production industry in the Union, commenced by the Division of Horticulture at the beginning of last war, has continued to make very satisfactory progress during the year under review. South Africa is to-day very largely independent of imports for its vegetable seed, and other countries in Europe and Africa are taking an ever increasing interest in South African vegetable seed. Not only have many enquiries been received from well-known seed-houses overseas, but very large orders for South African seeds have actually been placed by well-known overseas firms.

The registration and inspection scheme of the Division of Horticulture has made it possible to ensure to a very large degree, that good seed is marketed, and, as a result, farmers have come to realize that certified South African-produced seed is of good quality. This, in turn, has had a marked influence on breaking down the prejudice which exists in this country, amongst South Africans, against seed produced in the Union.

Considerable progress has been made with the breeding of high quality mother seed for distribution amongst commercial seed-growers. Additional staff, trained in the field of plant breeding or genetics,have been appointed to the establishment of this Division, so that future development in this direction can be expected to be even more rapid.

C. Inspection and Control.

The period under review covers a complete deciduous fruit season, as well as the latter portion of the 1945 citrus fruit season, and the first half of the 1946 citrus fruit season.

Citrus Fruit Exports.

The 1946 season showed a return to pre-war organization, and inspection centres with inspectors were set up at the following places throughout the Union, i.e. apart from Union ports and Lourenco Marques:—

Citrusdal (Clanwilliam), Patentie, Sunday's River Valley, Kirkwood, Grahamstown, Fort Beaufort, Muden (Natal), Rustenburg, Koster and Groot Marico, Zebediela, Tzaneen, Letaba, Elandshoek, Nelspruit, White River, Plaston and Karino.

The inspectors also inspected local market fruit prior to its despatch from production points.

Deciduous Fruit Exports.

The bulk of the deciduous fruit crop was again handled and controlled by the Deciduous Fruit Board. In addition to the inspection of export fruit, the inspectors of this Division inspected the Board's fruit at Cape Town and Port Elizabeth and also at inland production points, e.g. Constantia, Elgin, Stellenbosch, Groot Drakenstein, Paarl, Daljosaphat, Ceres, Hex River Valley and Ashton.

There was a considerable increase in exports due chiefly to the fact that Scandinavia took approximately 4,000 tons. Other destinations were, as previously, East and West African ports and the Middle East. A small shipment of grapes went to the United States of America.

Dried Fruits.

The bulk of the dried fruits exported consisted of raisins, and shipments, as during the war, were mainly to the United Kingdom, and to East and West African ports.

[*Continued on page* 273.

Protection and Classification of Plants.

R. A. Dyer, D.Sc., Chief of the Division of Botany and Plant Pathology.

Advisory Work.

THIS important aspect of the duties of the Division is steadily expanding in all sections. Correspondence with farmers and the general public, and, to a smaller extent, advisory visits take up a considerable amount of officers' time. But since the end of the war the staff position has improved somewhat and the research and other activities of the Division are being pursued more intensively than was possible during the previous year.

Botanical Section.

Botanical Survey.

The year under consideration saw the revival of the Botanical Survey under this Division. The Prinshof Experiment Station, Pretoria, was constituted the headquarters of the Survey and is the main plant-introduction station.

The first and most important task to be undertaken is well under way, i.e. the completion of a vegetation map of the Union on a scale large enough to be of use to agricultural workers in the field. It is based on the 1:500,000 Irrigation Department map which is complete for the whole Union. It is sufficiently large to show considerable detail, and will allow the work to be completed in approximately three years' time.

A classification of veld types of the eastern summer-rainfall portion of the Union has been made, and the areas occupied by these veld types have been demarcated over the greater portion of Natal, eastern Cape Province, eastern Orange Free State and southern Transvaal. In terms of the Irrigation Department map, this means that Sections 1, 2 and 5 are almost complete and should be ready for the printers during the forthcoming year. Thus the areas of greatest potential agricultural production in the country have been covered during the first year of the survey. The work is of the utmost value to other sections of the Department and has already played an important part in the agro-economic survey of the Union.

The collection, propagation and distribution of seed of useful veld plants are continuing on the veld reserves at Worcester, Fauresmith and Pretoria; while information on the spread of undesirable species of plants is also being accumulated.

A special botanical survey was made of the Kakamas Settlement area, parts of which revealed a serious state of deterioration.

Plant Physiology.

Attention has been focussed mainly on the physiological changes which take place during the wilting of lucerne and *Tribulus terrestris*. When grazed during wilting, these plants may respectively cause the animal disorders commonly referred to as bloating and geeldikkop, and result annually in heavy losses of stock. Plants grown on various types of soils (some known to produce toxic plants under certain climatic conditions) are being investigated with promising results. A common factor has been found in plants in a toxic condition of wilting. It is of relatively unstable character and partly of a saponin nature. The work is proceeding in collaboration with research workers of Onderstepoort.

Herbaria.

The National Herbarium at Pretoria, together with the regional herbaria, Natal Herbarium, Durban, and the Albany Museum Herbarium Grahamstown, handled in the neighbourhood of 10,000 specimens for classification. This service of classification and reporting on plants has been augmented by the appointment of a botanist stationed at Kimberley to serve the north-western Cape Province area.

In addition to serving the field officers of the Division numerous reports have been prepared for veterinary officers, farmers and students on such subjects as medicinal plants, poisonous plants, bee plants, fibre plants, weeds and plants which cause the tainting of milk.

Close touch has been maintained with workers in other herbaria of the Union and a continually expanding measure of collaboration exists with botanists in other African Territories. From within the Union valuable collections have been received from the Bolus Herbarium and the National Botanical Gardens, Kirstenbosch. Donations have also come from Mrs. Faulkner, Mr. Pedro and others in Moçambique; from the Amani Research Institute, Tanganyika Territory; Mrs. Benson in Nyasaland; and Messrs. Hendricks and Quarre in the Belgian Congo; as well as specimens collected by Mr. Milne-Redhead in Northern Rhodesia and Angola. Visiting botanists have made considerable use of the research facilities offered in the Union, one worker from Lourenço Marques remaining for a period of several months.

The following genera received special attention during the year: Rubus, Lippia, Salsola, Nestlera, Acacia, Encephalartos and Aloe, while the grasses always require the full attention of a qualified officer. A pamphlet on the common names of grasses is in the press and will be of considerable use to agricultural workers and farmers.

Other publications in the course of publication are illustrations and descriptions for the work *Flowering Plants of Africa*, while a revision of the genus *Tephrosia* and an account of the vegetation of the Wonderboom reserve are nearing completion. Flowering plants new to science and investigated during the year number about a dozen.

Pathology Section.

Potato Diseases.

Work on the production of virus-free seed at the Riet River Settlement entered a new phase when Departmental farming stopped and the settlers took over at the end of summer. Consequently, production was cut so as to provide just enough seed for the settlers and neighbouring farmers to start with; it amounted to about 2,000 bags.

The more important diseases which cause potato stocks to degenerate are carried by aphids. In the past, efforts have centred around the production of seed in areas relatively free from the aphids. Such areas exist in South Africa—Riet River is an example—but the quantitiy of land available in them is not unlimited. Consequently, the problem has been given a twist, and attention is now being paid to the possibility of minimizing the harm which an infestation of aphids can do, in the hope that the production of good seed can be undertaken in the unlimited land of areas in which aphids occur fairly commonly, though not in very great abundance. The same work will, it is hoped, show how the life of stocks can be extended

on the highveld, where it is important to maintain the vigour of stocks for 2 or 3 years, but where the great abundance of aphids renders this difficult, and the organization of the industry makes it unnecessary for stocks to be kept very much longer.

The testing of the Empire Potato Collection for resistance to disease and other valuable qualities continues. The indications are promising.

Bacterial Wilt of Tomatoes and Egg-Plant.

Bacterial wilt continues to occupy considerable attention. The resistant strains of egg-plant, distributed from the Botanic Station, Durban, continue to do well, and are in great demand. No variety of tomato, or species related to it, seems to possess resistance.

Mango Diseases.

A new inflorescence blight, caused by *Physalospora perseae* caused extensive damage in the Eastern Transvaal. Spraying, or dusting, with a 50:50 sulphur copper mixture effectively controls this disease, *Erysiphe cichoracearum*, and also anthracnose at the same time.

Citrus Diseases.

These continue to receive attention, especially black spot, and pitted stem of grapefruit.

Cereal Diseases.

Wheat.—Leaf diseases and black rust were largely absent during 1945. In 1946, however, young wheat plants were commonly attacked by orange leaf rust (*Puccinia triticina*) and mildew (*Erysiphe graminis*. Root-rot due to *Ophiobolus graminis* was only sporadically observed. In most of the cases the soil proved to be brak. Root-rot due to *Helminthosporium sativum* was more widely prevalent, but affected plants gave the impression of having been attacked previously by some dwarfing disease. Later it appeared that this stunted condition was caused by a virus disease. The causal virus is identical with that of maize-streak disease. The disease is distributed in every wheat-growing district of the Transvaal and should at present be considered the most important wheat disease of the province.

Oats.—The only disease found to be widespread in oats was loose smut (*Ustilago avenae*). In affected fields the damage varied from 30 to 80 per cent. In nearly all cases the infection could be traced to insufficient disinfection of the seed.

Barley.—Covered smut (*Ustilago hordei*) was observed in a few instances. In these particular cases losses from the disease never exceeded 5 per cent.

Maize.—A new ear rot for South Africa caused by *Basisporium gallarum* Moll has been reported. *Gibberella* ear rot was very troublesome this year owing to the damp weather during maturation of the cobs. Boil smut (*Ustilago zeae*) was occasionally observed. Maize-streak disease was widely prevalent during late summer. The low incidence of the disease in early plantings is apparently connected with either the prolonged drought or the severe winter of 1945.

Maize-streak virus was shown to be able to cause a severe stunting disease in wheat and, to infect barley, rye, and oats. The small

grains apparently help to carry a maize-streak infection from one mealie crop to another.

None of the South African maize varieties is immune to the disease. The strain of Hickory King selected at the Empire Cotton Experiment Station at Barberton for resistance against the disease appeared to be quite susceptible in the seedling stage. Varieties from the United States all showed a high degree of susceptibility. Among the relations of maize a variety of *Euchlaena mexicana* and one of *E. perennis* were found which proved immune. They may provide material for breeding resistant maize varieties. Efforts to produce such varieties are in progress. Among wheat varieties, only a few from Canada were found to be resistant.

Wattle Diseases.

Work on the isolation and identification of fungi associated with gummosis and wood rot, and the inoculation of trees with them was continued, as well as work on the vegetative propagation of wattles.

The Division's investigations on wattle diseases were terminated because of the resignation of the responsible officer and our inability to make a suitable new appointment. In any case, the work was soon to be taken over by the Wattle Research Institute being established at the Natal University College.

Plant Regulation and Inspection.

There have been four unfortunate discoveries during the recent past.

On potatoes, wart disease, *Synchitrium endobioticum*, was discovered on the town lands of Volksrust, Wakkerstroom, and Charlestown, just at a time when it was hoped that the country had seen the last of the disease. The usual quarantine measures have been applied.

On sugar-cane, mosaic disease was found in mild form an Co.281 and Co.301. Over the fields as a whole, the average infection is light and rather localized, but on a few estates there are patches of high infestation. A detailed survey is in progress. The discovery of mosaic disease dashed hopes that the disease was under control. When, some years ago, the sugar industry switched from the mosaic-immune Uba variety to resistant Co. types, efforts were made to eradicate the few existing acres of susceptible varieties. Unfortunately, a reservoir of infection must have been left, probably (to judge by local evidence) in native grasses (*Setaria* sp.), and it has spread to the cane fields.

On citrus, blackspot, caused by *Phoma citricarpa*, has existed for years in the wet areas near Pietermaritzburg, but was not seen elsewhere. Now it seems to possess considerable adaptation to drier parts, and has been found in widely separated areas of Natal and Transvaal. It may prove a serious nuisance to the citrus industry.

For grapefuit, the voluntary scheme for the certification of parent trees as a measure against *Psorosis* has had be be abandoned because of the almost universal presence of stem-pitting, a disease of obscure origin, but apparently transmitted by budding. Until such time as it is possible to identify the disease with certainty, it is safer to omit grapefruit from the scheme altogether.

For oranges, the parent-tree certification scheme is going well. The general inspection of citrus orchards for scaly bark has had to be curtailed to allow inspections to be made for mosaic disease of sugar-cane and black spot of citrus.

Inspection of vineyards for bacterial blight has been continued, though at far too slow a pace. About 13 million vines and 200 registered vine nurseries were examined in Somerset West, Stellenbosch, Paarl, Wellington, Worcester, Robertson, Montagu, Swellendam, Bonnievale, Tulbagh and Caledon. As a result of disease infection the farms of two registered nurserymen had to be placed in quarantine.

Horticultural Services and Research.—

[Continued from page 268.

Canned Fruits, Jams and Vegetables.

During the war the Department of Defence established a Food Technology Section which included in its activities the inspection of all canned foodstuffs produced in the Union; some of this inspection work was done on behalf of the Department of Agriculture and the Food Control Organization. Continuity in this inspection has been maintained, in that the Fruit Inspection Section is now doing this canning inspection, and also undertakes inspections of canned foodstuffs on behalf of the Department of Defence, thus reversing the war-time arrangement.

Inspection of canned foodstuffs is done at the ports and at canning centres, the chief of which are: Paarl, Daljosaphat and Wellington, Groot Drakenstein, Elgin, Wolseley, Worcester, Ashton, Mossel Bay, Port Elizabeth, Durban and Johannesburg.

Agricultural Research and Education.

H. W. Turpin, Ph.D., Director of the Division of Agricultural Education and Research.

THE reorganization of the Department at the end of 1945 facilitated a better co-ordination of research and educational functions. This, in itself, is bound to stimulate the development of research work at the Colleges of Agriculture, which in turn will prove most beneficial in the training of students. Moreover, it will result in a closer co-ordination of the various branches of agricultural research, such as animal husbandry, field husbandry, and grazing.

The Division intends gradually to transfer the responsibility of research to those areas which are being served by the Colleges of Agriculture, so that research schemes may be planned by the relative officers stationed there. The chief aim is the establishment of an effective educational and research service which will at once satisfy the demands of trained farmers and provide the technical staff for field work. In addition, research will be conducted in a manner calculated to direct the future developments of the country.

A serious shortage of professional officers has had a very hampering effect on the developments mentioned above, but did not prevent progress in other directions. The development which did take place is chiefly due to the enthusiasm, diligence and perseverance of the professional staff entrusted with the task of education and research and members of the staff of this Division thus deserve a word of appreciation for the manner in which they discharged their duties under most unfavourable circumstances.

The Division has made good progress during this, its first year. The establishment of the necessary administrative machinery entailed a considerable amount of work, but the results are already apparent in the smooth working of this machinery.

Administration and Staff.

With the establishment of the Division on 1 September, 1945, Dr. H. W. Turpin assumed duty as Director of Agricultural Education and Research, and Dr. A. R. Saunders was appointed to one of the two posts of Assistant Director. The other post is still vacant. Mr. H. H. Cornell was appointed to the new post of Principal Professional Officer (Education) on 1 December 1945, being entrusted with the co-ordination of training at the Colleges of Agriculture and serving as a liaison officer between the Director and the Principals of the Colleges of Agriculture.

Mr. C. R. Liebenberg was appointed Senior Professional Officer (Poultry) on 1 November 1945, to the vacancy which had existed since the death of Dr. Bronkhorst; in March 1946 Dr. J. W. Roland returned from the army to take up his post as Principal Professional Officer (Pasture Research).

In November 1945 Dr. Turpin, as a member of the Irrigation Finance Commission, left for Australia and returned to the Union in March 1946.

From the beginning of June 1946 Dr. A. R. Saunders was in England and America where, as a member of the scientific mission, under the direction of Dr. B. J. Schonland of the Council of Scientific

and Industrial Research, he attended scientific conferences of delegates of the British commonwealth. Since then he has been to the United States of America and Canada to study the latest developments in agricultural research. Dr. Saunders is not back yet.

The staff position was most difficult during the past year and, as stated above, proved to be the greatest retarding factor in the development of both the educational and research work of the Division.

On a percentage basis, it appears that 24·2 per cent. of the higher professional posts on the Divisional establishment and 38·3 per cent. of the posts at the Colleges of Agriculture are vacant, while in the Division as a whole, 29·4 per cent. of the approved posts are vacant.

I. Agricultural Education.

The educational programme of the Colleges of Agriculture for the past year may be discussed under two headings, viz.

(1) the re-introduction of normal regular courses;

(2) the provision of special short courses to satisfy the requirements of those ex-volunteers and civilians who cannot enrol for regular courses.

The second half of 1945 was devoted entirely to the second part of this programme but at the beginning of 1946 the Two-Year Diploma Course was again instituted and the Colleges of Agriculture practically resumed their normal educational activities.

Ex-volunteers were given precedence in all courses and it is gratifying to report that they made very good use of the privilege. No qualified ex-volunteer of the Union has been rejected for any course.

The following table reflects the number of students who attended the various courses.

College and Course.	Enrolment.		
	Ex-volunteers.	Civilians.	Total.
Potchefstroom.			
Junior Diploma Course................	40	—	40
Agricultural Instructors' Course (1 year)	17	—	17
Short courses (1 to 5 weeks)..........	380	154	534
Cedara.			
Senior Diploma Course................	13	—	13
Junior Diploma Course................	31	—	31
Agricultural Instructors' Course (6 mths.)	19	—	19
Special courses (8 weeks)..............	84	8	92
Short courses (1 to 3 weeks)..........	94	26	120
Seed-Potato Course (3 days)...........	—	90	90
Grootfontein.			
Junior Diploma Course................	24	—	24
Special Sheep and Wool Course (3 months.)	60	36	96
Soil-Erosion Courses (2 months)........	37	—	37
Glen.			
Junior Diploma Course................	1	23	24
Special Sheep and Wool Course (3 months)	1	15	16
Grain Grader's Course (4 weeks).......	—	59	59
Short course (1 to 2 weeks)...........	28	71	99
	829	482	1,311

Totals for all Colleges (all courses) are as follows:—

	Ex-volunteers.	Civilians.	Total.
Potchefstroom........................	437	154	591
Cedara..............................	241	124	365
Grootfontein.........................	121	36	157
Glen................................	30	168	198

As regards the Two-Year Diploma Course for 1946, it is noteworthy that a total of 341 applications were received for admision to the course, consisting of 133 from ex-volunteers, 155 from civilians and 53 from persons outside the Union. A total of 132 students, of whom 109 are ex-volunteers were enrolled for the Two-Year Diploma Course. The rest of the ex-volunteer applicants have either withdrawn or transferred their applications to 1947.

Programme and Prospects for 1947.

The Colleges of Agriculture have already received more applications for admission to the 1947 Diploma Course than can be accepted.

The position, according to the latest available figures, is as follows:—

	No. of Applications.			
	Ex-volunteers.	Civilians.	Applicants from outside the Union.	Total.
Cedara................	32	18	34	84
Grootfontein...........	9	25	—	34
Potchefstroom..........	19	30	—	49
Glen.............. ..	5	29	—	34
TOTAL.......	65	102	34	201

It should be mentioned that on 1 July 1946, Cedara had received applications for 1947 from 37 Union civilians and 49 others, in addition to 30 Union ex-volunteers, i.e. a total of 116 applicants. Since already at that stage, it was evident that all vacancies in the 1947 Junior Diploma Course at Cedara would be filled by ex-volunteers, 15 Union civilians and 22 other applicants, mostly from Southern Rhodesia, transferred their applications to 1948. Thus Cedara already has sufficient applicants for the 1948 course.

Precedence will be given to ex-volunteers until 30 September 1946 (this date inclusive). Subsequently, all vacancies in the course will be filled by Union civilians.

The programme for 1947 consists mainly of the Diploma Course, both Senior and Junior Courses at all colleges, the Special One-Year Sheep and Wool Course at Grootfontein, the 3 months' Sheep and Wool Course at Glen, and if accommodation permits, a limited programme of short courses of a special nature.

The expected enrolment for 1947 is as follows:—

Senior Diploma Course—all Colleges ... ... 110 students.
Junior Diploma Course—all Colleges ... ... 135 students.

Sheep and Wool Course, Grootfontein	18	students.
Sheep and Wool Course, Glen	20	students.
Other Courses	80	students.
TOTAL	363	students.

Reports of Colleges.

The reports on the work and activities of each College appear as annexures at the end of the Division's report in the following order:—

(*a*) Grootfontein College of Agriculture, Middelburg, C.P.
(*b*) Potchefstroom College of Agriculture.
(*c*) Glen College of Agriculture.
(*d*) Cedara College of Agriculture.

II. Research Work.

The reviews of the year's work in regard to research on animal husbandry, field husbandry and pastures, as described in the following chapters, give the desired data on the problems which are being tackled and the results already achieved.

Climatological Research.

Research on climatology was initiated with regard to agricultural problems, the chief aim being the geographical and climatical delimitation of the Union in order to encourage a better distribution of the animal breeds and plant varieties in accordance with their adaptability to climatic conditions.

(a) Research on Animal Husbandry.

The transfer of the former pasture research stations to this Division has rendered possible a more comprehensive animal husbandry research programme. Animal husbandry research has already been commenced at these institutions and in consequence of the close co-operation which is now possible in research between the branches of animal husbandry, field husbandry and pasture, farming problems can now be tackled effectively in their entirety in the various areas.

In the course of the year under review the following aspects of the work were carried out by the institutions indicated below.

College of Agriculture, Potchefstroom.

The nutritional investigation which is being subsidized by an annual grant of £500 by the firm Nasfeeds, has until now been focussed mainly on the nutritional value of South African feed crops.

During the year 62 digestion experiments were carried out on the chief South African hay and pasture crops.

In addition to this, investigation was also carried out on the intake of dry material in the case of sheep running on pasture and receiving hay.

This branch of animal husbandry research (i.e. nutrition) has a big leeway to make up and the shortage of staff is being acutely felt.

Vaalhartz.

The animal husbandry activities aim at the establishment of milk production under irrigation on a payable basis.

With lucerne hay as basis, supplemented by Sudan grass and babala pastures in summer and oats pastures in winter, the milk production unit experiment has given exceptionally good results.

With good producers, it proved possible to maintain a production of more than 4 gallon per cow per day over long periods. The unit consists of 30 cows on 24 morgen.

Sunn-hemp, although somewhat unpalatable, gave satisfactory results as silage.

A unit of diversified farming in which milk production, too, is to play a part, will be initiated this year.

Pig farming received considerable attention and exceptionally favourable results were obtained from the feeding of lucerne leaf meal in conjunction with maize and skim milk.

Mara.

Research on the adaption of exotic as well as indigenous breeds was continued and methods were developed for a more accurate determination of the difference in nature of the various types of coat—a factor which is closely allied to adaptability.

The transmission of this as well as tick-repellent characters is being studied, and breeding herds are selected on the basis of fertility and the ability to secrete sufficient milk for their calves.

Information is being collected in regard to the economic aspect of cattle ranching with different breeds in the bushveld. This information, taken in conjunction with the results of carcase analyses (which were initiated this year) will serve as a valuable guide in the selection of breeds for specific areas.

At the annual sale in May 1946, 32 bulls were sold at £1,007. The maximum price paid per bull was £127. 10s.

Messina.

Observations on the influence of climate on cattle are being continued and determinations of coefficients of resistance to heat once again proved that cattle older than two years suffer less in a hot climate than younger animals.

Dohne.

Experiments conducted with a view to increasing milk production during the summer months on grazing, without concentrates, have proved that the yield of 10 to 15 lb. of milk per day which is possible beween October and January on well-managed veld can be exactly doubled by providing 3 hours grazing per day on lucerne and Setaria or on Napier fodder grass. It required 25 morgen of each to provide the extra feed for 30 cows in order to maintain production on this level from December 1945 to the end of May 1946, without having to resort to concentrates.

The Red Poll and Friesland herds are also being used in an experiment in which the economy of various systems of milk production is compared.

The low butterfat content of the milk from the group of cows which are milked once a day and suckle their calves once a day, is a striking feature. According to tests, it amounts to 2·5 per cent., as against 4·072 per cent. for the other group which is milked twice and whose calves are being hand-reared.

Losperfontein.

Immunization of female calves for sale to settlers in heartwater areas was successfully continued. It is hoped that this aspect of the work will be still further extended this year.

A Jersey-herd has also been introduced at the station and observations of the relative efficacy of the two breeds under these conditions will be made as from this year.

Bathurst.

The prolonged drought seriously hampered the work, especially that done on grazing and milk production.

Interesting results were, however, obtained in regard to the utilization of sweet potatoes on the land by pigs. The work is still in progress and does not permit of final conclusions at this stage. Results obtained so far indicate, however, that the production costs of pork can in this way be reduced, with an increase in fecundity and a reduction in "uintjie" infestation on lands on which pigs are thus kept.

Kroonstad.

The testing of rations for milk production which consist almost exclusively of products which can be grown in this area has now reached a stage at which the results can be profitably used as a basis for research with regard to a farming system for the area concerned.

In the meantime, however, the work is not being expanded, in view of the desirability of shifting the experiment station. In any case lack of the necessary space at the station prevents expansion on any significant scale.

Koopmansfontein.

This station, as also the Rietvlei, Athole, Estcourt and Thabamhlope agricultural research stations now fall under this Division.

Although a considerable amount of preliminary work is still required, it is hoped that the animal husbandry programme will shortly come into full operation. This programme has, inter alia, the following aims:—

(1) *Beef production.*—Research on the best methods of herd and veld management. The latter aspect includes the control of vermeer bush.

(2) Milk production on veld: Experiments for establishing whether this form of husbandry can be placed on a footing which will not be detrimental to either the veld or the animal. The economy of milk production on the veld will be compared with exclusive beef production, and the relative suitability of indigenous and exotic breeds for both purposes will be determined.

(3) The development of a type of Africander cattle with an improved milk production capacity.

(4) The determination of the most suitable mating season for that area.

(5) The determination of a sound ratio between the number of cattle and sheep in that area.

Estcourt.

The rearing and finishing of steers up to the age of 2½ to 3 years on veld, grass hay and a small quantity of leguminous hay (for several consecutive years) testify to the value of judicious veld management in the long-grassveld area.

The animal husbandry aspect of the work now merits extension so as to include breeding animals. This extension will be effected as soon as additional land has been acquired.

Thabamhlope.

The preliminary work in connection with the growing of suitable fodder crops, the building up of soil fertility and the utilization of natural veld, has now reached a point which permits of changing over to more intensive systems of animal husbandry.

For this purpose an Ayrshire herd is now being built up for replacing the Red Polls.

Athole.

A Jersey as well as an Aberdeen-Angus herd is being built up here, with a view to initiating a milk cum beef-production unit.

The unit experiments aim at the development of farming systems under different conditions in that area to obtain the most beneficial utilization of the veld as well as of the arable land.

Rietvlei.

Tests in milk production at various levels of nutrition, i.e. various ratios of veld to crops are being initiated this year, with a view to giving guidance to farmers in various parts of the area served by this station. In addition, arrangements are being made for determining precisely the advantages of housing and the feeding of veld hay during winter.

Meat.

Constructive work on the grading of meat was continued.
Experiments were initiated with a view to determining:—

(i) The physical and chemical properties of beef of all grades.

(ii) The effect of feeding conditions and winter housing on the growth and quality of slaughter oxen.

(iii) The carcase quality of Africander and Africander crosses on exotic breeds at various ages and at various times of the year.

At the Rand Fat Livestock Show slaughtering tests were successfully carried out.

(b) Sheep and Wool.

In some parts of the Cape Province the drought of the past year is described as the most devastating in the history of those areas. It had a disastrous effect on the sheep and wool industry. The lamb crops were small, the clip was about 8 per cent. less and the scoured yield was much lower. These factors, in addition to the general poorer quality, resulted in a decline in prices. For example the price per lb. in Durban averaged 1·629 pence less that the previous year.

It is a gratifying feature that the accumulated quantities of wool which the South African Wool Marketing Organization took over from the British Wool Commission on 1 July 1945 have been considerably reduced. The quantity taken over approximated two full clips and on 30 June 1946 the unsold bales numbered 572,670. Almost one-third of this wool was produced by natives, while karakul wool also represents a considerable percentage (±14 per cent.). The wool sold has, naturally, not reached the sellers yet, but since factories the world over are working almost full time, it is hoped that the leeway will be made up in a comparatively short time.

Karakul Farming.

Karakul farming is flourishing; the highest average prices per pelt received by individual breeders have risen from 28s. in 1943 to 42s. in 1945. In the past season the average figure of 55s. per pelt was obtained by one of the producers.

As a result of these high prices a larger number of wool and meat producers are beginning to transform their enterprises—a tendency which must necessarily ultimately make itself felt on the meat and wool position of the Union.

Dohne.

The Dohne research station is situated in the sour grassveld area of the Eastern Cape Province. The rainfall and climate are conducive to farming enterprises of a more intensive nature which will perhaps also be more profitable than wool production. With a view to these possibilities experiments are being conducted to establish which mutton breeds and/or crosses between breeds are the most suitable for the area. Meanwhile investigation is also being made in connection with crops which lend themselves to fodder production.

The Dorset Horn and German Merino are being crossed with the Merino, and the study in connection with growth, wool production and feed requirements is being continued.

Similar work is being carried out at Kroonstad.

Potchefstroom College of Agriculture.

At this College of Agriculture two Blackhead Persian flocks are being graded up with half and three-quarter bred Dorset Horn × Persian rams. Good progress has already been recorded and the results bear out that in both flocks the first and second generation present a considerable improvement on the pure Persian. The lambs grow faster and their carcases attain a better grade on the market; they are also heavier.

The work has not advanced sufficiently to allow of comparisons between the two flocks. Work of this nature is also being carried out at the Vaal-Hartz Agricultural Research Station. The three-quarter bred Dorset-Persian ram is being used for grading. Ewes of the first and second generation appear to be eminently suitable for fat lamb production.

This grading has produced valuable information already and should be of great advantage to Persian-sheep farmers.

(c) Horse Breeding.

Heavy Horses.

The renewed interest in the breeding of heavy draught horses which arose during the war, still persists and prices of £210 for young stallions, £350 for mares and £160 for heavy geldings were obtained.

To promote this favourable trend, the Government has acquired five young Percheron mares and two young Percheron stallions from England for the Grootfontein stud. The horses are of good quality and are regarded as a valuable addition to the Government stud for the breeding of heavy horses.

In the course of the year the Clydesdale horse breeders founded their own society; at present four horse-breeders' societies are in existence, viz:—

The Horse and Mule Breeders' Association of South Africa.
The Percheron Horse Breeders' Association of South Africa.

The Saddle Horse Breeders' Association of South Africa and Rhodesia.

The Clydesdale Horse Breeders'. Association of South Africa.

In the Cape Province and the O.F.S. several private studs have been founded. In the Ceres-Tulbagh-Worcester-Robertson area for example, eight new studs were established. The Government studs to-day comprise 16 purebred stallions, 56 purebred mares and 66 high-grade mares, as also 12 young mares.

During the past year horsesickness occurred in certain areas in an exceptionally severe degree and the Government lost eight purebred mares and one purebred stallion, viz. " G. Karel ".

The percentage of foals bred in Government studs is somewhat low, viz. 55 per cent. It should be borne in mind, however, that this low figure is partly accounted for by shortage of staff and lack of proper facilities. The Government intends to offer short courses in the management and breeding of horses at Colleges of Agriculture. The first of these was held at Glen.

The Horse Improvement Scheme for Farmers inaugurated in 1939 is making favourable progress. Up to the present 1,400 mares have been served, 203 of these during the 1945-46 season.

Light Breeds.

The breeding of horses of a light type for general purposes unfortunately did not progress on the same sound basis as did that of heavy horses. Breeders hold divergent views—a fact which retards the building-up of a horse of a good light type.

The light mares which have been served during the year by Government stallions number 84, as compared with 116 during 1944-45. Five thoroughbred stallions are being kept for this purpose.

Donkey Stud.

The donkey stud at Potchefstroom remains the only source of registered jacks of good quality in the country. The stud is limited to twenty mares. During the year 16 surplus jennies were sold, having been eagerly acquired by farmers, who intend establishing their own donkey studs.

The high prices for young jacks which rose to £210 emphasize the scarcity of good breeding animals.

Under the Improvement Scheme for Farmers, ten jennies were served during the past season.

The oversea demand for horses and mules remains keen and large numbers of mules and horses were exported during the year. U.N.N.R.A. is at present acquiring thousands.

(d) Poultry.

The position as regards posts of poultry officers under this Division at 31 August 1946 was as follows:—(1) 1 Senior professional officer, 5 professional officers (2 vacant) and 9 Assistant professional officers (3 vacant.)

Education and Extension.

As in the past, the demand for poultry officers was again very heavy and the following figures give a survey of the activities of these officers during the past year.

Number of days on inspection work	505
Number of applications from farmers	1,757
Number of farms visited	749
Poultry on farms	512,070
Number of birds classed	142,450
Lectures and demonstration to farmers	81

Number of farmers attending lectures	1,537
Lectures to ordinary students	207
Lectures to students attending short courses ...	396
Judging at shows	34
Number of letters received	4,441
Number of letters dispatched	4,564
Number of articles written	11

The re-opening of the colleges at the beginning of the year, coupled with a shortage of staff, induced a considerable curtailment of extension services.

Egg-laying Competition.

The entries for the Central Egg-laying Competition at Glen were once again very heavy (Vide Report under College of Agriculture, Glen). At the beginning of the year a competition was opened in Durban, while the competition in Johannesburg was extended and another commenced in Cape Town. The applications for admission to the competition in every case exceeded the available accomodation. It would thus appear that breeders are increasingly realizing the value of tested animals, particularly cocks.

The Poultry Industry.

The first post-war year presents a very critical stage to the industry. In consequence of an acute shortage of maize and shortages of other cereal feeds and animal proteins, considerable reductions in poultry flocks had to be effected. In addition, the number of chicks which were hatched during the past season and which normally would have provided the country with eggs during the winter months had to be considerably curtailed. As a result of the inferior quality of the feeds and the poorer growth of the young birds, the reduced number of pullets and the increased use of eggs in the country, it is quite possible that the country may experience difficulty in satisfying its egg-requirements next winter.

Research Work.

Most of the poultry research work is concentrated at the Potchefstroom College of Agriculture. As a result of the shortage of foodstuffs, the number of poultry at the Colleges had to be considerably curtailed, which virtually led to the cessation of research. The following experiments were in progress at Potchefstroom:—

(i) Bloodmeal together with meatmeal in chicken rations.

(ii) Angola fishmeal in chicken and laying rations. Angola fishmeal is a new product which was placed on the market during the war and is imported from Angola.

(*a*) Angola fishmeal as compared with locally-manufactured fishmeal and meatmeal in chicken rations. As a result of shortages of other feeds which cannot be supplemented, no definite conclusions could be made.

(*b*) Angola fishmeal as compared with locally-manufactured fishmeal in laying rations. In this experiment too, no definite deductions can be made.

(iii) The effect of various quantities of proteins in rations on the growth of chicks during various periods of the year.

(iv) Meal pellets as compared with mashes in the rearing of ducks.

(e) Agronomical Research.

A number of projects were conducted at the following colleges of agriculture and research institutes: viz. the Potchefstroom and Grootfontein Colleges of Agriculture, and the research stations at Kroonstad, Nelspruit, Upington, Rustenburg, Hartebeespoort, Vaal-Hartz and Riet River.

Potchefstroom and Grootfontein.

Particulars of the local work on agronomy are published in the separate reports of these two Colleges of Agriculture.

Kroonstad.

At this station attention is focussed more particularly on agronomical problems and the breeding of yellow flint maize is continued. The indications seem to be that there is no or very little difference between the various sound rotational systems and that maize grown mono-culturally produces considerably less than maize grown in any of the rotational systems.

The highest yield of cowpea hay was obtained with a spacing of 6 inches in the rows.

The production of both grain and stover increases with a higher application of superphosphate. The highest relative increase goes hand in hand with the lowest application, viz. 200 lb. superphosphate per morgen.

Nelspruit.

The chief aim of research work at this station is the production of agricultural crops which are suitable for the lowveld areas, the determination of the best cultivation methods for various crops and the establishment of a sound rotational system which will also include vegetables. In the case of most experiments the same results have been obtained for years so that definite deductions can be made.

The programme of investigation included, in addition to the previous experiments, a few projects, and the following are some of the major directions in which research was conducted.

Snuff-tobacco.—The breeding of snuff-tobacco of high quality which will be Mosaic-resistant.

As regards the application of fertilizer to snuff-tobacco, it appears that kraal manure has to be given liberally. The application of comparatively high quantities of nitrogenous fertilizer is also necessary.

Streak disease in maize.—A further improvement in breeding lines was effected in connection with maize resistant to streak disease. The most resistant lines show a slight infestation of 5 per cent, whereas commercial varieties are affected to an extent of from 80 to 90 per cent., the yield per morgen decreasing rapidly with increased infestation of plants. The resistant maize variety is grown fairly generally in those areas where the disease occurs.

Testing of Different Varieties of Cassava.

It would appear that the best varieties yield approximately 14 to 18 tons of roots. This compares favourably with the yields in other countries. Approximately 6,000 lb. of tapioca can be obtained from 15 tons of roots representing a production of about £90 per morgen.

Control of Eelworm.—It can now definitely be accepted that eelworm can be entirely eradicated in beds of soil, provided such beds are kept clear from all vegetation for 18 months at least. Re-infestation by water or implements should be guarded against.

Experiments with Sweet Potatoes.—The work includes the introduction of an experiment in which 49 different varieties of the sweet potato are compared as regards yield, keeping quality, drought-resistance, vitamin and starch content, eelworm and disease resistance and cooking qualities.

Testing of Seed Potatoes from various sources.—It has been indicated once more that marked differences exist in the yielding capacity of seed potatoes obtained from various parts of the country.

Seed potatoes from the Woodbush area again produced good results and although they were outyielded by potatoes obtained from a few Cape sources, the latter were severely affected by scab and rhizoctonia. Thus for the lowveld, the Woodbush area would appear to be one of the best seed potato sources. The size of the seed potato has a definite bearing on its yield. The larger the tubers, the higher the yield per morgen.

Determination of the Suitability of various Crops.—Various crops have been grown for determining their suitability for these parts. The "Guduyathan Bunch" and "Natal Common" or "Improved Spanish" groundnuts are recommended. Sunn-hemp yields about 800-1,000 lb. fibre per morgen. Large quantities of tobacco seed were harvested and sold.

Upington.

This station was founded for the benefit of the large number of farmers and settlers along the lower Orange River, from Buchuberg to the Aughrabies valley—a distance of about 200 miles with irrigable lands. Lucerne, sultanas and wheat sometimes produce exceptionally large crops. The experiments show that most of the crops respond very well to the application of fertilizer, kraal manure and compost, and particularly to nitrogenous applications. The "brack" concentration of the soils is high—a condition which constitutes one of the main problems demanding serious attention.

Apart from variety tests with different crops, the application of fertilizer and compost and the application of a rotational system of cropping, it is most difficult to determine in what direction experiments should be carried out. As a result of abnormal conditions and price fluctuations, the farming system continually finds itself in a state of flux. The cultivation of lucerne, e.g., has been extended tremendously because of the high price of lucerne hay, whereas the area planted to wheat has been reduced and sultana vines have in some cases been removed in favour of the cultivation of lucerne.

Commercial production of vegetable seed, particularly of peas, has grown considerably.

Cowpeas and ordinary beans are attacked so severely by eelworm that the prospects of these crops in this area are not bright. Groundnuts, however, give good yields. Sunn-hemp is grown in the rotational experiments and, since this crop, in addition to being an excellent legume for green-manuring, is almost immune to eelworn attack, the yields of the subsequent crop are considerably higher than those of other systems which do not include sunn-hemp.

Rustenburg.

Good progress has been made with the building programme. Apart from the large air-curing barn, cellars, grading rooms, six flues, ten small experiment flues and two residences which have been constructed, a large laboratory has just been completed at a cost of approximately £30,000. Unfortunately, the houses for the professional staff have not been erected yet although funds are available for the building of two residential houses and bachelor flats. These houses will not be built before 1947. Lack of staff accommodation has a seriously hampering effect on the work. There are many serious problems bearing on insect pests, pathological conditions, physiological phenomena and chemical difficulties which urgently call for a solution.

Although the work has been seriously hampered by lack of the necessary facilities and staff, it is, nevertheless, expected that an appreciable amount of work of considerable importance will be done during the coming season. In the meantime experiments have been

conducted on different varieties of tobacco in connection with flue and air curing, espacement, effect of various types of soil and treatments on the quality of tobacco, breeding work, etc.

Research is being conducted on nicotine tobacco varieties, for which purpose *Nicotiana rustica* and *Nicotiana tabacum* are used.

Hartebeespoort.

The results of the experiments with wheat and tobacco definitely show that soil under irrigation is being drained of large quantities of nutrients. The nitrogen and organic material requirement, especially for winter crops, is very high.

Tobacco production is still on the increase, especially in the case of flue and air-cured tobacco of the light type which is suitable for cigarettes and pipe mixtures. Already the number of flues and barns for curing of light tobacco alone exceeds the 3,500 figure.

The green-manuring experiment has shown that the wheat yield is much higher when the crop is grown on lands immediately after sunn-hemp has been ploughed under instead of being removed as a fodder crop.

In the experiment on water-grass (uintjie) control it was observed that the number of plants decreased considerably more rapidly on ploughed land which is being grazed by pigs than on unploughed land which is also being grazed by these animals.

Velvet beans sown with maize supply excellent pasturage. Valuable data have been collected in this connection.

Vaalhartz.

The data collected in the course of the year agree in most respects with those of the previous years. For example, it has once again been evident that potatoes do not represent a suitable test crop for fertilizer experiments conducted on the type of plot which is to be found on the section. Control of diseases and pests and the proper cultivation of the crop are impossible. In these circumstances, is has been decided to use exclusively such eminently suitable crops as winter cereals, maize (sown early) groundnuts and lucerne as test crops for fundamental fertilizer experiments and then to determine the fertilizer requirements of potatoes and tobacco under more practical conditions of cultivation and rotation.

The supplementation of phosphate and nitrogen is equally important in both cases. This fact is confirmed by the results obtained from compost prepared in a soaking pit. Such compost contains very little nitrogen and consequently is practically useless as a direct manure. Judicious irrigation of soils and crops is of the utmost importance. The irrigation experiments for determining the quantity of water required and the time of application are being continued, and interesting results are obtained.

As regards winter cereals, it has once more been clearly established that sowing must be done moderately early. The value of the Scheepers variety for local sandy soils has once again been proved.

Up to the present a solution of the eelworm problem has not been found, although certain directions for further research have been indicated. The Division of Entomology intends to concentrate more on this matter and is already extending the relative experiments on a considerable scale.

Riet River Research Station.

This research station was established during the year on a part of the Riet River Settlement. This area is regarded as most suitable for the conservation of seed potatoes against degenerative

diseases. The aim is to use this station for the production of virus-free mother potatoes for the industry, with a view to rendering the Union independent of the importation of seed potatoes from Scotland, Ireland and other countries.

Virus-free seed potatoes grown at this station will be supplied for further propagation to seed potato growers' associations, situated in the most suitable seed potato areas so that a sufficient supply of Government certified virus-free seed potatoes may be available to producers of table potatoes. For the time being the Department will concentrate on Up-to-Date varieties, but in the near future attention will also be paid to suitable varieties for the coastal areas of the Southern Cape Province.

Potato Growers' Association.

The certification services of the Department are limited to seed potato growers' associations which were duly founded under the rules and regulations of the Department. Associations of this type registered at present number 47. During the past year these associations accounted for the production of 75,000 bags of Government-certified seed potatoes and it is expected that during the coming year the production of such seed potatoes will exceed 100,000 bags.

The seed potato growers' associations are at present properly organized into 9 regional federations which again have formed a central body, viz. the South African Seed Potato Growers' Union. In order to obtain the necessary funds for a general promotion of the certified seed potato industry, the regional federations have decided to pay a voluntary levy of 5d. per bag on certified seed potatoes grown by their associations to the South African Seed Potato Growers' Union. Certificates are supplied by the Department to the Union mentioned, at 1d. each.

New Zealand Hemp (Phorium tenax).

In the course of the past year a company was induced to undertake the production of this fibrous plant and a plantation of 60 acres was bought at Melmoth in Zululand which produces sufficient suckers for planting approximately another 1,500 acres. On account of the difficulty experienced by this country in obtaining bags, the planting work is being extended as quickly as possible, since the plant produces a fibre which is eminently suited to the spinning and weaving of bags. The Division is at present investigating the possibilities of all suitable fibrous plants with a view to encouraging the cultivation of the most suitable plants on a large scale. Fibrous plants such as sunn-hemp, *Hibiscus cannabinus*, *Urena lobata*, flax and similar plants are now being investigated. At present *Phorium tenax* which adapts itself to large areas of the country extending from Zululand to George, appears to be one of the most promising plants.

Pasture Research.

The problems bearing on beneficial soil utilization, soil fertility and the maintenance and improvement of our natural flora, are closely allied with the farming intensity in the areas where farming is carried on more extensively, but particularly in those areas where a large-scale development can be expected, such as in the diversified farming and crop-production areas. All these problems are inherent in the methods of soil conservation and veld management. Research work in the past has clearly shown that the necessary information in this connection is not available yet. The first requirement is a thorough knowledge of the veld and the manner in which its vigour can be maintained under conditions of maximum exploitation.

In certain areas work on this matter has made good progress, but in others such as the Karroo, the western stock-farming areas, the north-eastern Cape Province and the western slopes of the Drakensberg Mountains, it is hampered by an acute shortage of staff.

Grass Plantings in Rotational Cropping Systems.

It is a fact generally acknowledged and one which has moreover also been proved, that stabilization of a large part of our cropping areas can be effected by including grass leys in our rotational cropping. In the moister areas, where grasses such as Rhodes-grass, and in the marginal areas, where Paspalum can be easily grown, this practice is rapidly developing. In the drier marginal, and in infertile areas, grasses suitable for this purpose have not yet been found—a fact which is ascribable to lack of seed supplies, seeding being the only method by which grass plantings in large areas can be established. A great deal of attention is to-day being focussed on the harvesting of seed, methods for the collection of suitable seed in large quantities, suitable methods of cultivation for rapidly establishing grass lands under unfavourable conditions, the viability of seed, fertilizer, etc.

The inclusion of suitable grasses in the cropping system is by no means a simple matter, since the suitability has to be judged according to the aim of the system, e.g. whether it is intended mainly for a cash or as a fodder crop, whether the croppings area is utilized in conjunction with a large or a small area of veld and whether the soil is fertile or not.

A high standard of soil fertility is required, if some grass plantings are to make satisfactory growth. On the other hand, many cropping lands are most infertile and are in desperate need of the establishment of a perennial grass. It is, therefore, necessary to discriminate between grasses which will adapt themselves to infertile soil and thus initiate the process of building-up, and those grasses which will maintain the fertility of rich soil. The succession of crops, legumes and grasses is a subject of which relatively little is known and rotational cropping experiments are being undertaken under a diversity of conditions both with and without veld grazing, on the so-called unit experiments. In these unit experiments a flock or herd is kept on a definite area and the efficacy of the various methods of veld utilization and rotational cropping system is investigated.

The research of the past has focussed attention on another point of interest, viz., the difficulty of providing stock with sufficient protein. In Europe a mixture of perennial rye grass and clover constitutes the basis of grass planting husbandry, but we in South Africa do not possess similar pastures for the drier crop-production areas. The natural veld of the Karroo, the bushveld and the western districts abound in legumes and other protein-rich plants, but the dry parts of the highveld, the eastern Cape Province and the western Orange Free State experience great difficulty in this respect. The feeding and breeding of livestock will be considerably assisted by the inclusion of perennial legumes in grass plantings in these areas, or alternatively, by the establishment of good leguminous trees such as Mesquite, Honey Locust and the Carob which are planted on a large scale for this purpose in countries bordering on the Mediterranean.

The research work at the various experiment stations described below is focussed mainly on the collection of data in this connection.

which may be expected to furnish the necessary information for the adaptation of soil conservation to the demands made on the soil.

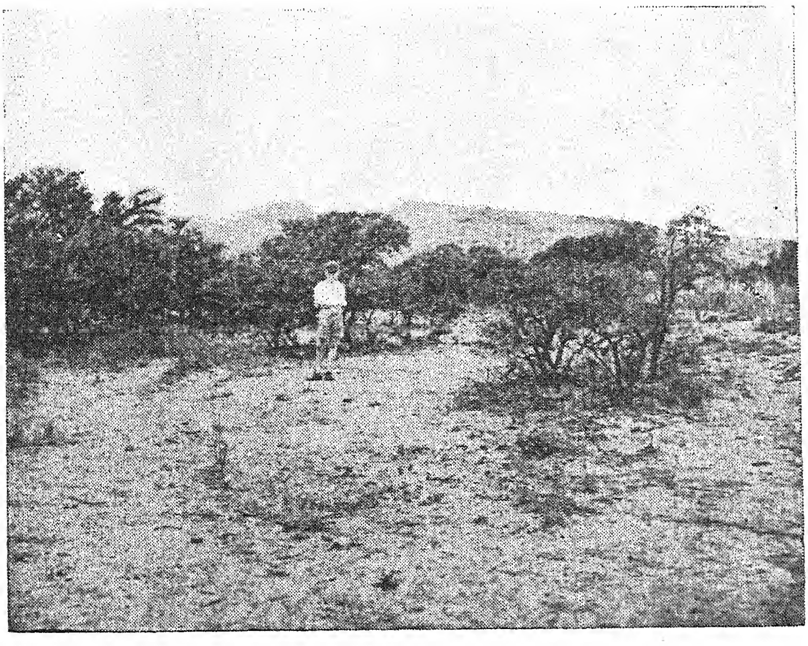
The importation and testing of new grasses are being continued and the work relative to the survey and utilization of soil in those areas served by various research stations is being continued.

The value of good veld-management and conservation practices was thrown into relief during the drought of last year. There still exists an acute shortage of staff, and unless this shortage is supplemented, it will be most difficult to carry research out succesfully in areas such as the Karroo, the western slopes of the Drakensberg Mountains, the marginal areas and the dry grain areas.

The data collected during the past six years at the various centres, are now being correlated so as to link up with the second Progress Report, issued in 1940. Below is a recapitulation of the activities at each station.

Estcourt Agricultural Research Station.

The year 1945-46 was definitely the driest year in the history of farming in this district.



(1) Trampled out thorn veld (1938.)

A unit experiment is in progress in connection with veld management where Hereford-Africander cross beef breeds are bred on thorn veld. It is an important fact that thorn veld maintains cattle in good condition during summer as well as in winter after the calves have been weaned. A cow nursing a calf in winter, however, requires supplementary feeding. Mating should therefore be so regulated that all calves are weaned before winter.

Experiments are being conducted with certain patent remedies for the eradication of bush, but the results will not become evident

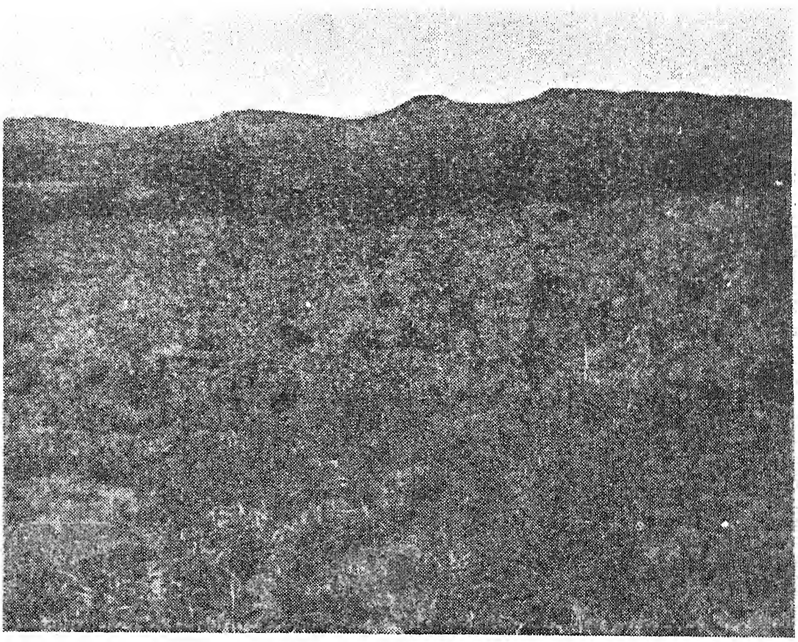
before next year. Experiments with veld fires in the longgrass-veld, without grazing, once again revealed the undesirability of the practice of early burning and the extremely injurious effect of autumn fires. The mowing of all old grasses after winter for composting has proved to be the best method. Where mowing is impossible the best time for burning is after the first good spring rains, provided that such burning takes place only every alternate year.

Sound methods of veld management have resulted in such an improvement in the veld, that the differences are clearly discernable. A unit experiment on longgrass-veld testifies to the fact that slaughter stock can be economically marketed from the veld.

Fertilizer experiments have been conducted on the yield and composition of veld hay.

The planting of grasses in dongas has yielded very important results. Methods of donga control which, although inexpensive, nevertheless yield exceptional results, have been tested at this station and are practicable in large parts of the Union.

The veld-hay yield amounts to approximately one-third of the ordinary yield. The costs of veld hay were higher on account of the low yield. Important results have been obtained with veld management, veld fires, donga reclamation and grazing experiments on irrigated pastures. The drought has brought the importance of this work into relief.



(2) The same spot as that shown in Fig. 1 (1946): the thorn trees have been removed and the grass cover has been restored by good veld management.

Thabamhlope Agricultural Research Station (Estcourt).

The balance between veld, artificial pastures and crops is a matter which is becoming increasingly important, since crops are doing excellently during dry seasons, whereas the veld and artificial pastures are yielding well during seasons characterized by a heavy rainfall. This aspect is being thoroughly investigated.

The crumb-structure of the soil demands investigation. The influence of kraal manure, compost and artificial pastures on the soil structure is an important factor and is being investigated.

The drought allowed of very little veld growth and the making of veld hay proved uneconomic. Winter fodder had to be provided for cattle.

Rietvlei Agricultural Research Station (Pretoria).

A survey of the agricultural systems of the Bankeveld Area which is being served by the Rietvlei Experiment Station, shows that the requirements and demand of the large centres such as Johannesburg and Pretoria stimulate poultry, vegetable, flower and pig farming and that cattle farming is receding further and further from the cities. The price of land is high and farms are small.

Veld grazing systems on mowable veld show that:—

(1) prime beef can be produced on veld hay only if bonemeal and salt are added to the rations.

(2) the carrying capacity of veld is at the utmost 1 beast per 3 morgen. A decrease in the yield of hay is noted from year to year. The grazing intensity is therefore probably too high.

Further experiments are being conducted with a view to determining the balance between veld and arable land and making provision for high-producing animals for 12 months of the year. In this investigation use is being made of pastures, hay, silage and perennial crops.

Soil conservation is the basis of the work at Rietvlei and all lands are being laid out on the contour, contour banks or terraces being constructed, wherever necessary. Roads, drainage furrows, the planting of trees and the construction of a new dam are all being fitted into the conservation system as a whole.

Koopmansfontein Agricultural Research Station (Griqualand West).

The original aim of the work at this station was to collect data on the control of vermeerbos, a poisonous weed which abounds in this area and annually causes severe stock losses. The actual experimental work dates from the beginning of October 1944 only.

Various systems of grazing are being tested out. On account of the long-term nature of the field experiments, no significant differences can be discerned between the various methods.

In the past no attention was given to animal husbandry, but since dairy-farming is practised so generally in this area, the following problems are now being investigated:—

1. Differences in growth between cows, young heifers and steers kept under ordinary ranching and veld-dairying farming conditions.
2. Differences in milk production of various breeds and crosses.
3. Various calving seasons.
4. Sheep crosses with a view to breeding animals for slaughtering.

The growing of fodder trees and spineless cactus is receiving attention with a view to making provision for fodder in times of scarcity.

Excessive grazing has damaged the veld to such an extent already that "vermeerbos", Cape Slangkop and "maluie", etc., now constitute a menace to cattle farming. Results indicate that the veld, if managed correctly, is capable of marvellous recovery. Farmers are beginning to display an interest.

Towoomba Agricultural Research Station (Warmbaths).

Veld management experiments indicate:—

1. that annual grazing during the same season is not a sound principle;
2. that rapid rotational grazing on very diversified veld is not successful, since the sweeter grasses are selected, and
3. displaced seasonal grazing is the only effective system of veld management.

The problem of selective grazing on very diversified veld is still awaiting a solution. In those cases where mowing for hay is possible, the position is simpler. Large areas of the very diversified veld, however, are of a stony and bushy nature, which renders mowing impossible.

Veld recovery experiments indicate that absolute rest during the period of growth is the most effective method of restoring injured veld. Further investigation is in progress.

Thornbush encroachment presents a serious problem in the bushveld. Research work is being carried out in an endeavour to determine the causes of this phenomenon. Chemical and mechanical methods are being tested out for the effective eradication and control of thorn bush.

The reclamation of old lands is a further subject of investigation. In the nursery various grasses are grown, with a view to finding suitable types which will be a successful ley in a rotational system.

As a stand-by in time of need, fodder trees and spineless cactus are grown, and tests are carried out on these. The chief object of these tests is to supplement the natural veld.

Because of the wide range of veld types found in the Bushveld, co-operative grazing exepriments are being carried out on various types of veld.

Gifblaar and gou-siekte bush which annually account for tremendous livestock losses in Waterberg present a serious problem for research.

In order to carry out meteorological observations, a climatological meteorological station has been fully equipped.

Athole Agricultural Research Station (Ermelo).

A feature of the past year was a devastating drought, especially in spring. Feed reserves were exhausted even before the rains fell, with the result that the animals at the institution suffered severe losses in weight until grazing became available. Excessive rains fell once more in January and February exercising a very hampering effect on the cultivation of lands and the making of hay.

Great progress has been made with the preliminary work in the establishment of a milk-unit experiment comprising a balanced farming system with dairy cows, pigs and Percheron horses.

An Africander unit experiment commenced on 1 October, 1943 has already progressed beyond the developmental stage.

During the past season an adequate supply of grazing and hay was available. The provision of green feed for calves during the winter months presents a problem demanding further investigation.

A rotational cropping experiment with grass and maize shows that the alternate planting of these crops gives higher yields than those obtained when these crops are continuously cultivated on the same soil in mono-culture.

Artificial pastures are playing an increasingly important rôle and farmers are displaying much interest in the work already. *Acroceras macrum* and *Setaria*, because of their high yields, high nutritive value and palatability, are two of the most valuable fodder

grasses. These two grasses are being subjected to further tests and should play an important rôle in this area.

In the control of erosion *Acroceras*, especially the runner type, gives excellent results.

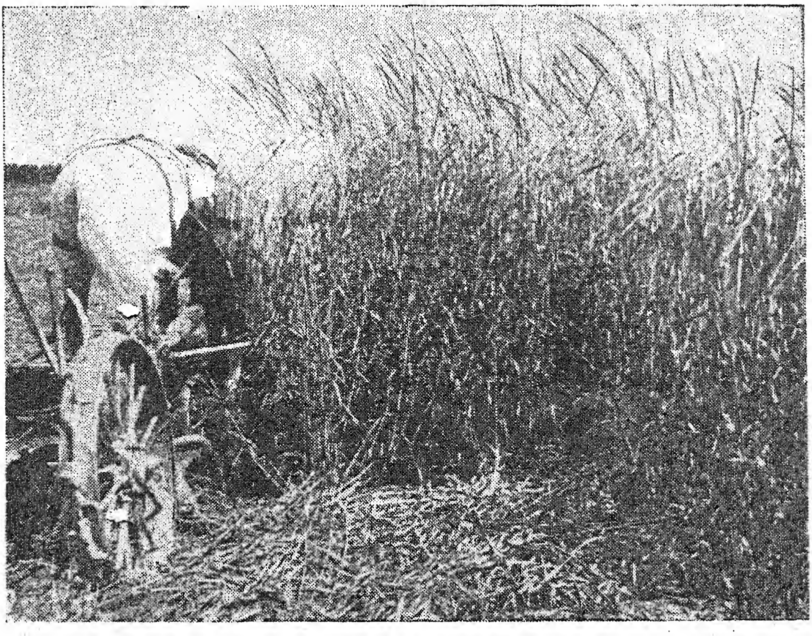
Experimental work on veld management has further established the importance of the following factors which had been determined earlier:—

(i) the area is more suitable for cattle than for sheep;
(ii) a system of rapid rotational grazing is the most effective method of veld management;
(iii) severe grazing is the most profitable method on sourveld;
(iv) a complete rest every few years is essential;
(v) spring resting, followed by grazing, is disadvantageous to both veld and livestock;
(vi) it is better to mow sourveld grass than to burn it;
(vii) the best time for burning is during spring, after good rains.

The keeping of Percheron stallions under the Horse-improvement Scheme B for servicing mares of farmers in the locality is an aspect receiving attention at present.

Dohne Agricultural Research Station (Stutterheim).

The influence of the animal on the veld and *vice versa* under certain systems of veld control with a view to the provision of feeds from the veld in winter, is being investigated.



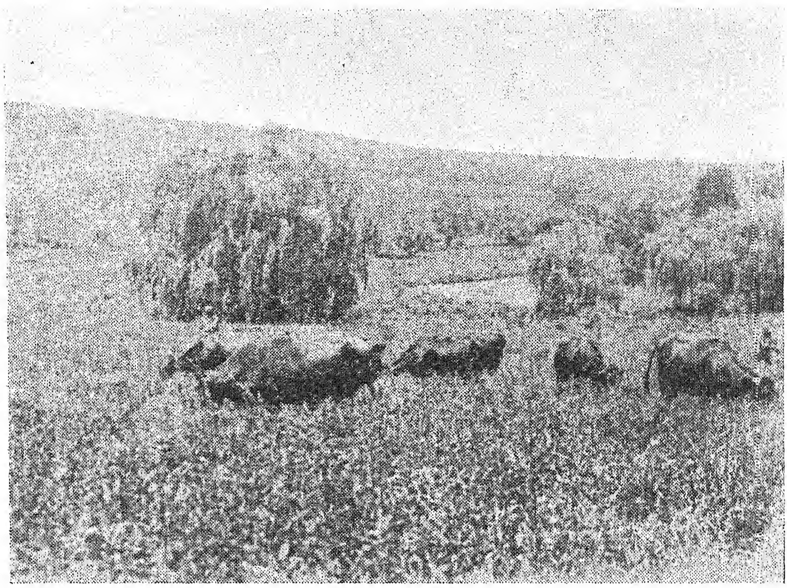
Dohne Research Station. *Setaria kazungula* being mown five months after planting.

Research is also being conducted on the influence of certain intensities of mowing, fertilizer application and burning on the yield and composition of veld.

The investigational work also includes the supplementation of natural veld by means of artificial pastures and various crops in the form of pastures, hay and silage.

The value of perennial grasses in the building-up of fertility in old played-out lands once again became apparent in a case where a piece of old land which had been under Rhodes grass for four years, showed outstanding increases in yield, as against a piece planted to annuals.

Setaria grasses and Napier fodder are yielding exceptionally highly and are receiving special attention from farmers. In addition, Italian rye-grass, *Phalaris tuberosa*, wild white clover and Chilian red clover are fast gaining popularity as perennial winter pastures.



Cows on a mixture of *Phalaris tuberosa* and Italian rye grass on Mr. McKinnon's farm.

Langebosch Agricultural Research Station (Grahamstown).

The summer season of 1945-46 was perhaps the driest ever experienced in the coastal belt and shortly after the autumn rains set in, frost occurred on a more severe scale than ever before. Experience has induced farmers in the district to build a number of dams and silos. Soil erosion is ravaging the Ciskei to an alarming degree and it is possible that a large percentage of the population will have to be shifted before reclamation work can be undertaken with any success.

An experiment on veld control which is now in its second year, already shows an improved vegetal cover as compared with uncontrolled veld.

The long-term soil fertility experiment envisages the establishment of the influence of certain methods of treatment on the soil where such soil is subjected for a long period to the same treatment. The establishment of grass leys for two and four years is compared with a continuous crop production and the influence of compost is also being gauged.

Two green-manuring experiments were commenced on both good and poor soil and experiments on chicory production are being

conducted in collaboration with the Division of Chemical Services.

Co-operative experiments on the farm Baildon are being continued. Special attention is being given to artificial pastures and lucerne.

Grootfontein College of Agriculture—Pasture-Research Section.

The chief aim of this pasture-research section is to study the various types of veld in relation to soil, climate, topography and the farm animal with a view to ensuring the maximum utilization of the veld, if water and soil are conserved, i.e., to apply good systems of veld management for soil and veld conservation.

This section serves an area of 30,000 square miles of the eastern diversified Karroo.

Small-scale experiments are being conducted on various representative types of veld, with a view to determining the yielding capacity of each and to investigating the influence of the various grazing systems.

The results obtained so far may be summarized as follows:—

(i) the more promising rotational grazing systems induced a considerable increase in grass and a reduction in the incidence of soil erosion, accompanied by a simultaneous reduction in the density of steekgras and Karroo bush;

(ii) under systems of continuous grazing the veld changed very little, steekgras and shrubs grew apace and the soil eroded to the same extent as before the experiment;

(iii) under the system of continuous grazing, sheep maintained their condition better than those sheep subjected to the rotational grazing systems, in spite of the fact that identical numbers were kept per morgen.

Large scale experiments are now being laid out for application on a practical scale. The control system and general treatment will be worked out in collaboration with the other research sections of the institution.

Various fodder trees which are resistant to drought and frost, are being investigated with a view to the provision of feed and shelter.

Potchefstroom College of Agriculture—Pasture-Research Section.

In spite of the relatively poor rainfall during the past year the animals on the veld grazing experiments remained in a relatively good condition.

The drought prevailing during this year proved beyond a doubt that the running of 1 head of cattle on 2 morgen of land as is now being done in the veld-grazing experiment ,camps, is definitely overtaxing the carrying capacity. It would be more desirable to accept carrying capacity as 4 to 4½ morgen per animal.

On account of the drought the veld on the hay plots did not progress to such extent as to allow of mowing. Experiments are being conducted with artificial pastures as compared with annual crops.

In the nursery, promising grasses and leguminous plants are continually being tested. The demand for Napier fodder and Setaria kazungula is exceptionally heavy. Plots have been planted to Kudzu and *Glycine javanica*; the latter has shown a much better stand than the former so far. Twenty six varieties of spineless cactus are progressing extremely well.

A survey of plants was made this season in the whole-year veld grazing camps. The denuded patches in the camps of the rotational grazing systems will be compared with those in the camps which are being continuously grazed.

III. The Colleges of Agriculture.

Grootfontein College of Agriculture, Middelburg Cape.

(Principal: G. J. Schuurman, H.D.A., F.T.I.)

During the concluding years of the war one of the functions of the College, viz. agricultural education, ceased altogether, but these activities have been resumed this year in spite of the shortage of staff. Although in due course all extension work will be undertaken by the Division of Soil Conservation and Extension, officers were still obliged to devote much of their time to this service. In the case of crop production, lucerne and potato inspection occupied so much time that officers were compelled to curtail research work. Research in other sections has made considerable progress and the Sheep and Wool Research Section has increased its staff from 5 in 1941 to 18.

Exceptionally dry conditions prevailed during the past year and a rainfall of 8·82 inches only was recorded during the year. The veld in particular was poor, which necessitated supplementary feeding and the removal of 58 oxen to other districts for better grazing. Since the storage dams were empty, production was limited to what could be grown with water from fountains and boreholes.

The value of the dryland lucerne of the institution was again appreciated this year when 283 tons were mown on 60·5 morgen: the best part, 18·5 morgen in extent, yielded 205 tons. Owing to lack of water the irrigation lands yielded only 89 tons on 35 morgen. In addition, the production of the farm section was as follows:—165 tons of maize silage; 456 bags of oats, 10 tons of oat hay; 146 bags of potatoes; 41 tons of pumpkins and 9 bags of dried beans; 52 morgen under winter cereals have been grazed.

The Horticultural Section plot which measures $1^1/_{10}$ morgen produced a bumper crop of 49,520 lb. of vegetables, valued at £206.

The Animal-Husbandry Section. The numbers of animals kept are as follows:—64 Jerseys, 35 Frieslands, 64 horses (including Percherons), 36 mules and donkeys and 24 pigs.

A shortage of fodder limited the production of milk and butter. The death of the Jersey cow, "Grootfontein Violet", which holds the milk and butterfat record for South Africa was a heavy blow.

The Percheron stallion, "Lakanal", died during the past year. A Percheron stallion and 5 Percheron mares were imported from England and arrived here in June. Young Percheron stallions and 7 mares were sold for £700.

The sheep at Grootfontein numbering 5,175 produced an income of £5,576, of which £2,401 was derived from the sale of 8 karakul rams and 11 karakul ewes. The prices fetched ranged from £27. 10s. to £295 for rams and £47 to £140 for ewes. As a result of the drought the lamb crop obtained from all flocks was small.

The Poultry Section. The chief breeds now being kept are the White Leghorns and Australorps (both white and black). Special attention is being focussed on the development of certain desirable strains. As regards the White Australorp, difficult problems have to be overcome, and are receiving serious attention. The general mangement of the flock has been considerably facilitated by the erection of three semi-intensive houses, each capable of accomodating 100 birds.

The shortage of certain ingredients in the mashes, as well as the shortage of maize, is clearly reflected in the production as well as in the general appearance of the birds.

Agricultural Education.

During the year two special three-month courses in sheep and wool and two courses in soil conservation of 8 weeks each were held. The latter courses were intended for ex-soldiers exclusively, while opportunity was granted to civilians to fill the remaining vacancies in the sheep and wool courses.

A total of 133 students attended these courses, 97 being ex-soldiers and 36 civilians. Thirty-four applicants were refused admission.

The re-introduction of the two-year diploma course in February 1946 has found much favour with the farming community. The full number of 24 soldiers has been enrolled. Twenty-one civilian applicants had to be refused admission.

The decision to replace the three-months' course in sheep and wool appears to be equally popular. The number of applications for the two-year diploma and the one-year special course in sheep and wool for 1947 surpass all expectations and consequently a large number of applicants will be disappointed.

Extension Work.—In the course of the year 119 lectures and demonstrations, attended by 2,576 farmers, were given in the country districts. In addition to these, 8 short courses in sheep and wool were held on farms. Officers visited 1,247 farmers on their farms, inspected 584 bulls and made 1,232 preliminary and 737 final soil-erosion surveys. Officers dispatched 13,600 letters; of these, 3,300 were of an advisory nature, and the remainder dealt with administration and agricultural education. The number of visitors to the College amounted to 814. Officers attended 34 conferences and 19 agricultural shows. Officers of the chemical section made 310 analyses for the public and 1,795 in connection with research.

Research Work.

Chemical Services.—In spite of the shortage of staff, numerous analyses were made in connection with research work. In the event of any further development, this Section will have to be enlarged.

Some of the experiments which have been concluded, revealed that the run-off of rain water on denuded soils is 100 per cent. higher than that on grass or bush areas. Moreover, it appeared that a total application of 18 inches of water, either in the form of irrigation or of rainwater, is required for the production of an economic crop of winter cereals and that a four-feet profile should have an available water content of 9 inches at least.

The experiments on fallowing, ammonium sulphate on red Karroo soils, the making and utilization of compost, Langebaan phosphate and locust bait are still in progress, and in many cases promising results may be expected.

Crop Production.—As a result of transfers and resignations of the staff, research work has been seriously curtailed. Further, 40 per cent. of the time of officers was taken up by extension work.

The year was exceptionally dry, only 8·82 inches of rain having been recorded. Severe frost in October caused considerable damage to winter-cereal experiments.

The lucerne-breeding experiment is confined to the inbreeding of various strains, mainly with a view to the production of better hay, pasture and dryland types and of types more resistant to frost.

Twenty potato varieties have been introduced from America and Britain. Since these varieties were received late, a percentage of the seed potatoes were planted at the Bathurst Experiment Station, where superior yields were obtained from the American varieties. The virus content of the plants displayed considerable variations,

the highest infection, viz. 14·7 per cent., occurring in Chippewa, 7 per cent. in Green Mountain (American varieties) and 5 per cent. in Flourball (British variety).

The physical condition of the soil, which had been planted for five years to winter and summer cereals, still shows a decidedly advantageous effect, which, however, is beginning to be less pronounced after three maize crops have been produced.

The spineless cactus on the experiment plot has been severely damaged by cochineal. Observations are being made to determine whether there are varieties which are resistant to the insect; the blue-leaved varieties which as Monterey Chico and Robuste appear to be the most resistant.

Entomology.—On account of the general drought which prevailed during the year no heavy infestations of Karroo caterpillars occurred. During the period February to April, however, a heavy caterpillar outbreak was reported from the southern part of Cradock, where good rains had fallen shortly before.

Light outbreaks occurred during March and April 1946 at Middelburg, but these were confined mainly to vleis where the rain had fallen in strips.

Parasites.—In addition to the three species previously imported, six new species have been introduced, viz., *Meteorus loxostegei; Bracon vulgaris; Achaetoneura archippivara; Cryptus sp.; Phoracera sp.*, and *Stomatomya sp.* All these new introductions readily parasitized on the Karroo caterpillar and have been successfully bred in the laboratory.

As had been done in the past large numbers of the parasite *Chelonus texanum* were again released in the Middelburg district this year. Small numbers of *Cryptus* and *Phoracera sp.* were also liberated. It is, however, not possible to determine as yet whether these parasites will prove a success in the veld.

Sheep and Wool Research.

Nutrition and Veld Management.—The palatibility and nutritive value of the prickly pear and agave were compared in nutritional experiments. During a four-month period, merino hamels of 80 lb. live weight gained weight more rapidly on a ration of 5lb. prickly pears, supplemented by 18 oz. of lucerne hay, than on a ration of 3·6 lb. agave, supplemented by 18 oz. lucerne hay. Agave is less palatable than prickly pears. Sheep are capable of ingesting large quantities of prickly pear—as much as 9·6 lb.—which means that only 10 oz. of lucerne hay is required to supplement the ration.

Chico, a species of prickly pear, is less susceptible to destruction by cactoblastis and cochineal but not as tasty as Fusicaulus, although its nutritive value is equal to that of the latter. The spines of the former damages the digestive tract only slightly and in the case of a small percentage of animals only.

A biennial grazing of prickly pear ensures a higher carrying capacity than does an annual grazing.

An annual grazing of salt bush during the winter does not reduce the carrying capacity of such plantations.

In order to ensure satisfactory growth in merino ewes from the age of 4½ months, rations of a high nutritional standard (S.E. 1·913) should be fed. A ration of 20 oz. of maize and 2·5 lb. of lucerne hay per 100 lb. live weight gave the best results. Lower nutritional standards (S.E. 1·535 and 1·337) arrest growth, reduce wool production and have an injurious effect on sex activity, and consequently also on the fertility of ewes. The inclusion of prickly pear does not enhance the effectiveness of a ration provided that 0·5 lb. of lucerne

hay is replaced by 3 lb. of prickly pear. The poor growth of merino flock ewes which, at the age of 4½ months, weigh 36·0 lb. is due to poor nutrition.

Better results were obtained by feeding young merino ewes according to body weight and not according to body surface (W2/3).

Individual feeding of ewes supplied valuable information as regards the consumption and utilization of feed.

Continuous grazing of Karroo veld with 1 sheep per morgen gives poorer results as regards growth and wool production than a grazing with 1 sheep per 1½ morgen. If short periods of rotational grazing are resorted to, according to calendar months, and not according to seasons, both growth and wool production are poor. If poor systems of grazing are adopted, the losses during drought mount as high as 60 per cent.

Fertility in Rams.—Fertility in rams of 10 breeds and types is being studied throughout the year by means of sperm tests. Clinical abnormalities have occurred already and are being studied. The tests indicate that fertility in certain breeds and types is reduced at times.

Genetics, including Breed and Type Developments.

Type development in merinos (plain-bodied versus ultra plain-bodied type). Considerable progress was made in the application of the technique of description, scoring and progeny testing. Exaggerated faults such as folds on the body and fold-development in the crutch were eliminated and a definite direction in the development of the two types can be established. The ultra plain-bodied sheep are somewhat heavier than those with moderately developed skin folds. The wool yield of the two types in the case of young sheep born in March-April 1944 and shorn at the age of 18 months was as follows (calculated on a basis of 365 days' growth).

	Plain-bodied Type.		Ultra Plain Type.	
	Rams.	Ewes.	Rams.	Ewes.
	lb.	lb.	lb.	lb.
Wool-in-the-grease......	16·38	13·99	16·58	13·28
Scoured wool (% reclaimed)	7·72	6·98	7·60	6·92
Clean yield............	48·60	51·50	47·60	53·30

Development of Merino Types less Susceptible to Blowfly Strike.

The object of this policy is to produce a breed that will be less susceptible to blowfly strike.

Blowfly strike occurs on a considerably smaller scale in the "less susceptible" group.

Mutton Breeds and Types.

(*a*) A Dorset Horn stud and a Southdown stud are being kept.

(*b*) A ¾-bred Dorset Horn × Merino type is being bred with a view to developing a hardy and good mutton breed which will lamb in autumn.

(*c*) Dorset Horn × Merino half-bred ewes are superior to Romney Marsh and Border Leicester × Merino half-bred ewes for the rearing of lambs on lucerne pasture during summer and on winter cereal pasture during winter. As many as 140 per cent. lambs are born and these attain a weight of 65 lb. per lamb (a carcase weight of 32 lb.) within 90 to 120 days.

Although pure-bred Southdown rams are the best sires for fat-lamb production, the ¾-bred Southdown × Blackhead Persian rams are

good substitutes, giving even better lambing results.

(*d*) A very attractive mutton type is being developed from the Southdown × Blackhead Persian, but unfortunately the birth figure during autumn amounts to 2 to 3 per cent. only.

(*e*) A fine mutton breed is being developed from the Dorset Horn × Blackhead Persian. This type lambs in autumn and the lambs reach a marketable weight as high as about 65 lb. at the age of 5 to 6 months on natural veld.

(*f*) An improved Blackhead Persian is being developed by the employment of a special variation of a F2 Dorset Horn × Blackhead Persian which is marked in the same way as the Persian. This type is better fleshed, reaches sexual maturity earlier and does not carry superfluous localized fat.

Wool Research.

(*a*) Wool research is carried out with all merino and cross-bred wool obtained from experimental sheep. Determinations are being carried out of scoured yields, fibre-fineness, fibre length and the presence of medulla in wool fibres.

(*b*) Only a limited number of inquiries for fleece analyses were received from farmers. The College endeavours to encourage such analyses so that the data may be included in a progeny test scheme which will give better guidance to farmers in their breeding and selection of sheep.

(*c*) Special studies on the physical characters of wool were carried out at 20 different places on six individual merino sheep. Other studies include changes in the wool of merino rams according to change in age.

Co-operative Experiments on Farms.

Farmers in Colesberg, Hopetown and Fraserburg breed a hardy type of mutton breed from the Dorset Horn, Blackhead Persian on the half-bred basis. Some farmers have progressed so far already that a uniform breeding stud can be selected.

Karakul Grading Up Experiment.

A comparison was drawn between the employment of the curl and flat curl types karakul rams for the grading up of Blackhead Persian ewes. No significant differences between the two types were observed in the skins of the first and second crosses. As indicated by the following figures, however, the curl-type skins of the third cross-bred lambs appear to show a marked improvement as compared with the flat-curl type.

CLASSING OF SKINS.

Type.	No. of Lambs.	Good.	Average.	Too Smooth.
Curl Type..............	16	62%	19%	19%
Flat Curl Type.........	25	32%	20%	48%

Potchefstroom College of Agriculture.

[Principal: G. J. Bosman, B.Sc. (Agric.)]

During the past year drought conditions prevailed and the total rainfall was seven inches below the average of 24·03 inches. The maize crop, however, was saved by good rains during January and March and since the first frost occurred only on 4 June even the late maize varieties reached maturity.

Staff Changes.—The following officers left the institution during the year: Dr. G. C. Theron, Botanist; J. P. v. d. Walt (dairy

officer); Miss Heyns, Matron; E. C. Sanders, Assistant Poultry Officer (resigned); Mr. J. F. Burger, Senior College Officer, resigned for health reasons.

The following officers assumed duty: G. A. Gill, Botanist, was appointed as Senior College Officer (Education); J. G. Marais, Farm Manager; J. G. C. Beukes, temporary instructor in field husbandry; J. W. C. Mostert, Assistant Professional Officer (Pasture Research); H. J. Lighthelm, Dairy Officer; W. A. Poggenpoel, Technical Assistant (Animal Husbandry Research); F. A. Murray (Pasture Research); N. J. H. Thomas, Technical Assistant (Poultry); C. L. Marais, Assistant Poultry Officer; Miss S. Z. M. Kilfoil, Matron, and Mrs. E. K. J. Hoff, Assistant Matron. Mr. H. G. Toua, Assistant to the Lecturer in Poultry has been transferred to the Sheep and Wool Section.

Education.

In August 1945 the One-year Agricultural Instructors' Course was commenced with seventeen students, all ex-volunteers. Fourteen of these successfully completed the course in June 1946. They were all either appointed to posts in the Departments of Agriculture or Lands or else allotted holdings on settlements.

In January 1946, 40 students, again all ex-volunteers were enrolled for the Two-year Diploma Course. In the first semester three of these students withdrew from the course.

A series of short courses in animal and field husbandry, farm management, poultry and horticulture, each covering a period of 10 weeks, were held throughout the year. A total of 534 students, including 380 ex-volunteers, viz. 349 men and 31 women, and 154 civilians (103 men, 51 women) attended short cousres.

Other short courses dealt with bees, milk testing (two) and grain-grading.

Extension Work.

Correspondence and visits to the institutions have increased considerably. It would appear that the public is at long last becoming more appreciative of the value of agricultural colleges and is utilizing the services offered by them to an ever-increasing extent. Important among such services are those rendered by the chemical section; 678 soil samples were investigated, 316 manure and fertilizer samples, 169 feeds and 30 dips, water and sundry materials were analysed. Poultry officers visited 353 poultry farms, classed 80,530 head of poultry on farms, wrote 1,793 letters, held 16 lectures and judged at 4 agricultural shows.

Yields.—Owing to the fact that the post of farm manager was vacant between January and October 1945, the farm section suffered tremendously. If unfavourable weather conditions are taken into account, the yields were, generally speaking, satisfactory, as would appear from the following figures: lucerne hay 523 tons, maize 960 bags, maize silage 184 tons, oat cereals 387 bags, barley cereals 77 bags, wheat cereals 41 bags, pumpkin 8 tons, potatoes 255 bags.

Four varieties of maize were grown for seed production and 205 bags of seed maize were sold to the public.

The numbers of livestock on hand on 31 August 1946 were as follows:—Africander cattle 25, dairy cattle (Frieslands, Guernseys, and Jerseys) 97, draught oxen 100, experimental oxen on grazing plots 36, horses 46, donkeys 45, mules 20, sheep 692 and poultry 872.

At the annual stud stock sale on 26 June 1946 the following prices were realized:—One Catalonian jack £84, 15 Catalonian jennies £262, 4 cross-bred horses £96, 13 Africander bulls £488, 1 Friesland bull £68, 2 Geurnsey bulls £30, 1 Jersey bull £32.

Twenty-five head of cattle were transferred to the Mara Experiment Station.

There continues to be a big demand from the public for the servicing of mares and jennies. Eighty-one mares and 12 jennies were served by thoroughbred and Percheron stallions.

Dairy products to the value of £953 were sold and the value issued to sections and hostels amounted to £648. New equipment was ordered to replace that which depreciated during the war. A new cooling-installation is expected shortly.

Seed Testing.

The number of seed samples tested, increased from 301 during 1942-43 to 2,034 during 1945-46. The application of the regulations framed under the Seed and Weed Acts on lucerne, teff seed and other seeds resulted in a great improvement. Almost all lucerne and teff seed sold to-day is of a standard quality. Formerly, teff seed often contained 10 per cent. and more sand and considerable quantities of water grass (uintjie) seed. No prosecutions were instituted during the year since the people concerned clearly indicated their intention of effecting an improvement.

Seed-Growers' Associations in Western Transvaal.

The four seed-potato growers' associations and the two Seed-maize Growers' associations served by officers of the College of Agriculture, gathered fairly good crops for seed during the past season, but the yields of the seed-maize associations were comparatively poor. The membership of the latter nevertheless increased considerably and it is hoped that considerably larger quantities of seed maize will be produced next year. The seed associations do useful work in that they employ the services of research officers of the Department for increasing the seed of new varieties; consequently the founding of such societies is desirable.

Sheep and Wool.

The past year may be regarded as an average one for sheep farming, although bluetongue was very severe in autumn and caused losses. The sheep blowfly was exceptionally active in spring and D.D.T. was successfully used. Ticks, too, were troublesome.

Research Work.

Field Husbandry.—The experiments on which detailed reports are made comprise plant breeding, field husbandry and fertilizer experiments. In the course of the year a new rotational cropping experiment was laid out, including a perennial grass. A grass fallowing experiment was initiated in collaboration with the Division of Soil Conservation and Extension. The grass-breeding work formerly conducted at the Prinshof Grass Breeding Station has been transferred to this Institution.

Arrangements have been made for the institution of large-scale potato breeding experiments in which the material of the potato collection of the Commonwealth will be used.

Plantbreeding.—Progress has been made with the investigation of the breeding of hybrid maize seed. The sweet-corn syntheses have been increased and the seed will be planted during next season for purposes of testing by canners. A certain measure of progress can be reported as regards the sorghum breeding experiment but the continuous cropping on witchweed infested lands and insect pests are hampering factors. The witchweed resistant variety, 37R9, proved so excellent under cultivation and is being so widely used, that it will be quite safe to use it as a basis for future breeding work.

Although the abnormal conditions prevailing during the flowering period prevented the formation of new soybean crosses, the segregating populations nevertheless produced a considerable number of selections.

The issue of the new type, 3706, has probably made practicable the breeding of erect drought resistant cowpeas. Out of the available breeding sources a collection of wild Vigna's has been made and fresh efforts will be directed at crossing them with cultivated varieties.

The wheat breeding experiment has now reached a stage where new combinations between parents with a high-yielding capacity and disease-resistant lines which have been bred earlier are about to be made. Another series of combinations which have now reached the testing stage are those derived from the Agropyron hybridization. This group is more promising as a source of disease resistance than most wide hybridizations between wheat species tested at this station.

In the groundnut breeding experiment, the idea is to combine the deserving characters of varieties from South America, Java and the United States of America, all of which are too late for our conditions, with early maturity characters.

The Agropyron wheat experiment has yielded annuals of great value to the wheat breeding experiment so far, but for the production of large seeded perennials, the experiment has not been under way long enough for it to be of much value.

Field-crop Experiments.—A large number of the experiments were adversely affected by the theft of green maize ears. The most striking result was that obtained in the experiment of ploughing *versus* superficial cultivation. It is evident that the Faulkner doctrines are not without danger for the South African grain farmer. The reduction of expensive ploughing to a minimum is a matter of common sense and conforms to the requirements of good crop production, but it is quite clear that this method of cultivation cannot be unreservedly abandoned.

The experiment with alternate rows of maize and cowpeas has again revealed that it is a poor policy where a maize crop is the object. This method has certain merits where the production of animal fodder is the main aim.

Fertilizer Experiments.—These data conform to those of previous years wherever phosphate plays the main rôle. In addition this year's results indicate that it does not matter much whether the phosphate is applied in the form of artificial fertilizer, compost or kraal manure. These fertilizers seem to have no effect other than that due directly to their phosphate content. Up till now there appears to be no striking reaction to nitrogen fertilizers, although indications point to an incipient lack of nitrogen in those soils which have been under cultivation for a considerable time.

The oldest fertilizer experiment has been in progress for 24 years. The yield of the unfertilized plots in this experiment still averages 11·25 bags per morgen. This fact testifies above all to the value of effective weed control.

Research on Animal Husbandry.—The work on animal-feed research is mainly focussed on the determination of the nutritive values of South-African fodder crops by means of a series of digestion experiments with sheep. Experiments were conducted with various hays such as lucerne, teff, Sudan grass, etc. Pasture crops such as Algerian oats, Victoria grass, babala, etc., were also tested and comparative results obtained.

Glen College of Agriculture.

(Principal: I. P. J. du Plessis, B.A., M.Sc.)

During the year under review the summer rains fell particularly late—too late for those grain farmers who were compelled to plough and plant with lean oxen. It was thus impossible to plant all lands and where late plantings were effected, it was feared that little maize would mature. Frost, however, was exceptionally late in coming, with the result that reasonably good crops are being harvested. In some districts the harvest is practically normal in spite of the delay of more than a month in planting.

The late rains presaged a good wheat year for the Free State grain farmers, and as a result of the encouraging prices for wheat, more wheat has been planted this year than ever before.

The absence of summer rains until the end of December 1945 resulted in the drying up of the Glen irrigation water supply in the Modder River. For almost 2 months (19 November to 13 January) the lands could not be watered. Fortunately, the lucerne-hay supply of the previous summer was sufficient to tide the livestock over the dry period. In spite of the delayed summer season both as regards harvests and pastures, Glen prospered well, as the figures below indicate.

Features of the Year.

Features of the year were, *inter alia*, the resumption of the Diploma Course and an exceptionally heavy demand for training courses; the Departmental re-organization which separated the extension services from the colleges; the withdrawal of the soil-erosion control staff after the system of broad-base terracing had reached the sixth year of its rapid development; the general shortage of technical staff—the lecturing personnel at Glen having been reduced to a third of its normal strength. On the farmers' side, may be mentioned the organized support of the marketing legislation and the conception of orderly marketing; the growing conviction amongst farmers, especially grain farmers, of the necessity of farming mechanization with its resultant heavy demand for power tractors and similar farming machinery, agricultural implements, etc., the growing realization that precautionary measures are essential to farming, particularly in so far as water and fodder conservation are concerned; the definite development of farming organization in the co-operative direction.

Staff.—The aftermath of war conditions was most exacting on the attenuated staff. Of the 42 approved posts of the salaried staff of the college 30 were occupied on 31 August 1946 (9 out of the 12 vacancies being for higher professional and technical officers) of the 18 Divisional officers normally stationed at Glen, only 9 were left at the college, so that out of a staff of 60 officers, 39 were in the service of the College in 31 August 1946.

Students.

Of the students who attennded, 30 were ex-volunteers and 168 civilians. (See table on next page for attendance.) ...

Certificates.—In May 1946, 14 certificates were issued to successful candidates in the Three-months' course in Sheep and Wool Classing. In respect of the Grain Grading Course of May 1946, 19 grain-grading certificates were issued, of which 6 were partial grading certificates.

Study Bursaries.—Four study bursaries of £15 each were awarded to Diploma students during the year. There was no demand for O.F.S. bursaries from Free State students at Glen.

Employment.—The Institution still receives applications and enquiries in connection with men trained in the various branches of farming and dairying.

The attendance at the various courses held during the year was as follows:—

Course.	Period.	No. of Students.
Judging of Africander Cattle	15/10/45 to 19/10/45	24
Junior Diploma	5/2/46 to 11/12/46	24
Three Months' Course in Sheep and Wool Classing	5/2/46 to 8/5/46	16
Blacksmithing	25/3/46 to 29/3/46	6
Grain Grading	29/4/46 to 23/5/46	29
Dairy Farming and Pigs	13/5/46 to 23/5/46	17
Farm Engineering	27/5/46 to 7/6/46	12
Blacksmithing	17/6/46 to 21/6/46	6
Poultry Farming	8/7/46 to 19/7/46	13
Cheese Making	8/7/46 to 19/7/46	10
Milk Testing	22/7/46 to 26/7/46	12
Grain Grading	6/8/46 to 30/8/46	29
		198

Livestock.—The numbers of livestock kept for training and research were as follows on 31 August:—

Frieslands	98 (38 grade, 60 stud).
Africander Stud Cattle	74
Stud Horses	13
Draught Horses and Mules	36
Draught Oxen	74
Merino Sheep	1,261
Large White Pigs	21
Poultry	1,020

The hens participating in the Egg-laying Competition are not included in these. No livestock losses worth mentioning are to be reported. All breeds show a good increase and satisfactory production.

Production and Income.—Surplus livestock realized high prices at sales. The demand for grade Friesland bulls and breeding pigs at scheduled prices is heavy. Surplus livestock were sold at about £2,000 cash, apart from free issues to state institutions. After provision has been made for the hostel and other institutions, the surplus farm products (livestock, wool, eggs, butter, meat, vegetables etc.) together with the college and boarding fees gave a cash income of £7,351.

As regards free issues to *other* state institutions, it may be important to mention that during he past 11 years Glen has issued value averaging £700 per annum and received value averaging £369 per annum, free. For the twelve months ending 31 August 1946 the figures are:—issued £518 and received £276.

The irrigation dam in the Modder River was pumped empty on 19 November 1945 and the river did not come down again until 14 January 1946. In spite of the set-back, 272 tons of lucerne hay were made. In addition, 60 tons of other hays and 355 tons of silage were made. As regards dryland maize Glen was fortunate to harvest in this unfavourable year, 312 bags besides the silage. The Friesland herd produced 27,777 gallons of milk, and 3,543 lb. of butter were made for home consumption.

Extension Work.

Although the extension work was to be taken over by the Division of Soil Conservation and Extension as from the beginning of the year under review, this change was effected very gradually and Glen still had to deal with applications for advice, etc., from its area. Owing, however, to the re-introduction of the Two-Year Diploma Course, and the attenuated staff, it was found impossible to satisfy the extension requirements in full. Farmers made extensive use of the telephone, however, and paid personal visits to the institution to make enquiries into various farming matters. The following figures give some indication of certain extension services rendered during the year under review.

13 Shows, 28 Judges.

21 Farmers' days; 38 lecturers; 125 lectures delivered on farmers' days and at demonstrations.

4,421 Persons addressed.

389 Farms visited, erosion work not excluded; 5 wool courses held; 8,730 letters of an advisory nature written, 7 press articles written; 5 articles written for *Farming in South Africa*. 12 radio talks prepared; 2,590 sheep classed; 29,700 head of poultry classed.

Soil and Veld Conservation.—During the first four months of the year under review, the erosion staff consisted of two engineers and six trained assistants. The chief demand was for the survey of the broad-base system of contouring for the protection of lands, but the staff could not cope with the demand. The building of silos and van Meerten dams also received attention. Seventy silos were finally valued, 1,156 reports on dams and other anti-erosion works were prepared and 1,264 inspections carried out.

The broad-base terrace system of contouring is now generally practised in the crop-production area of the Free State. Farmers who can afford to buy the necessary levelling instruments make their own surveys, generally subject to the advice of the Department, but sometimes without applying for subsidies. The number of such broad-base terrace contours completed in this manner with the aid of extension officers this year is unknown, but 1,200 miles of broad-base terrace contours were completed this year under the supervision of Glen, bringing the total completed in lands in the Eastern Free State since 1940 up to 3,520 miles.

The main factors militating against the control of veld still remain the lack of and exorbitant prices for fencing material. Not until fencing material becomes plentiful and cheap will the veld-management problem ease, especially in the western dry areas.

Bull Inspections.—The Animal-Husbandry Section inspected 165 bulls in accordance with the provisions of the Livestock and Meat Industries Act, 1934; of these 42 were registered and 123 grade bulls; 68 bulls (60 grade) were rejected.

Horse-Improvement Scheme.—Owing to shortage of grazing and stable accommodation, this service was temporarily suspended.

Seed-Potato Inspection for the Seed Certification Scheme was carried out on the farms of members of the Westminster, Bethlehem, Tweespruit and Warden Seed-Potato Growers' Associations.

Central Egg-laying Competition.—The Twentieth Open Competition and The Twelfth Breeders' Register Test which were commenced on 3 April 1945, were concluded on 4 March 1946, with the following results.

Of a total of 1,410 hens entered, 884 hens were accepted as follows:—

Open Competition: 287 heavy and 288 light breeds—575 hens.
Breeders' Register Test: 103 heavy and 166 light breeds—269 hens.

Colleges of Agriculture.—Heavy and light breeds.—40 hens.

The highest producer in the open competition was a Rhode Island Red hen which laid 300 A, 4 B, and 0 C eggs.

In the Breeders' Register Test the best layer was a Black Australorp which produced 304 A, 0 B and 1 C eggs.

The cash and book income of the Central Egg-laying competition amounted to £1,462 of which registration fees represented £314, cash sales of eggs £770. 10s. and issues of eggs for departmental use, £377. 10s. The running expenses of the competition (including labour, feeds and other requirements, but apart from the salary of the Manager) amounted to £1,200.

The Central Competition for 1946-47 commenced on 2 April, 1946. Hens numbering 870 were entered as follows:—

Open competition, 455 hens (240 heavy and 215 light breeds),
Breeders' Register competition 360 hens (170 heavy and 190 light breeds),
Colleges of Agriculture, 55 hens.

Since the results of the Central Egg-laying Competition have a high advertisement value for the owners of birds of outstanding achievement, the number of entries during the past few years regularly exceeded the available accommodation (900 maximum). The figures for the past few years are as follows:—

1944-45: 1,245 entered, 865 accepted.
1945-46: 1,410 entered, 884 accepted.
1946-47: 1,480 entered, 870 accepted.

Farm Improvements.—The team of semi-fit European labourers at Glen continued their useful soil and veld protection work along the fertile, but easily eroded banks of the Modder River. With the completion of the seventh large embankment, an area of more than 25 morgen of severely damaged and threatened soil has been stabilized and largely reclaimed.

Improvements to buildings etc., include the conversion of the old underground hatching room of the poultry section into three useful rooms; concrete partitions, troughs, etc., native location.

As a result of the acquisition of an additional tractor and two motor lorries ox traction and the ox-wagon can now, fortunately, be eliminated to some extent. This gradual modernization of the farm transport vehicles and traction presents a progressive step also from an economic point of view.

Research Work.

The technical staff are continuously studying the climatic and other agricultural factors which condition the productivity of an area in respect of every branch of farming. The various professional officers visit farms either individually or collectively for this purpose. In co-operation with the farmer, experiments are conducted, observations made and farming systems developed. This practical and direct method of investigation has already borne good fruit.

Intensive and full-time research could not be conducted through lack of staff. Mention can, however, be made of the *run-off experiment*

which continues to yield interesting results on the red soil of Glen with a 5 per cent. gradient, and of certain *field-crop experiments* which were in progress during the year under review, viz.—

(1) *The Rotational Cropping Experiment* which will be discontinued next year.

(2) *The Maize Variety and Spacing Experiment*, which is being continued, but has been hampered by the drought of the past year.

(3) *The Sweet Sorghum Variety Experiment* for silage purposes in which "Wintersome" showed a production of 41¾ tons per morgen this year. Next came "Soetriet" 284 with a yield of 28·8 tons per morgen followed by "Haakdoorn" with a yield of 28·5 tons per morgen.

(4) *The Boer-Millet Rate of Seeding Experiment*, in which the highest hay yields were obtained from those plots sown to 35 lb. of seed per morgen.

(5) *The Millet Variety Experiment* for hay purposes, in which the "Proso-millet" with a yield of 6·4 tons per morgen outyielded the other varieties.

(6) *The Cowpea Variety Experiment* which was affected by climatic conditions, but is being continued.

(7) *The Soybean Variety and Spacing Experiment* for hay purposes in which selection No. 34. S. 288 yielded 4·5 tons of hay per morgen and No. 34 S. 395, 4·3 tons of hay per morgen.

(8) *The Teff Variety Experiment* for hay in which "Inbruin" with a yield of 7 tons of hay per morgen made the best show as compared with ordinary brown teff, Inwit, Uniwit, Erowit and Unibruin.

(9) *Potato-Variety Experiment.*—The following 15 varieties of imported seed potatoes were planted: Ulster Gromligh, Ulster Earl, Stormont Star, Stormont Dawn, Arran Peak, Up-to-Date (Irish), Up-to-Date (Suttons), Up-to-Date (Castel), Kerr's Pink, Flourball, Epicure, Arran Chief, King George, Sebago and Sequaia. The Irish Up-to-Date with a production of 185·3 bags per morgen was significantly better than Stormont Star, Ulster Earl, Sebago, Arran Chief, Arran Peak, Kerr's Pink, Flourball, King George, Epicure and Stormont Dawn. Stormont Dawn with a production of 84·3 bags per morgen was significantly poorer than the rest, except Epicure. Virus infecfection occurred significantly less in Stormont Dawn, Up-to-Date (Irish), Arran Peak and Up-to-Date (Castel) than in Sebago, Kerr's Peak, Ulster, Gromligh and Sequaia.

(10) *Potato-Variety Experiment with Canadian Seed Potatoes.*—The following six varieties were planted: Bliss Triumph, Green Mountain, Katahdin, Irish Cobler, Hauma and Chippewa. Green Mountain, with a production of 162·8 bags was significantly better than the others. Irish Cobler, with a production of 113·4 bags per morgen was significantly poorer than all others. As for virus infestation Chippewa was significantly poorer than all others.

(11) *Maize Fertilizer Experiment in the Sandveld Area.*—Owing to the drought these experiment plots in the Hoop stad District were not planted this year.

Cedara College of Agriculture.

[Principal: J. Fisher, N.D.A., B.Sc.(Agric.), D.Sc.]

The staff strength of the college on 31 August 1946 was as follows: —

Professional Officers stationed there.	31/8/46		31/8/45	
	College.	Div.	College.	Div.
Higher	9	4	9	7
Lower	—	1	—	—
General	12	3	12	2
Clerical	4	—	3	—
	25	8	24	9

In the past year several staff changes occurred, e.g. Mr. Allison was appointed Lecturer in Dairying; Mr. Coetzee, Botanist, was transferred to Glen and Mr. Theron, First Grade Clerk, resigned from the service. Several new appointments have been made, namely Messrs. Ross and Sifman in Field Husbandry, Mr. Saayman in Horticulture, Mr. Spronk in. Animal Husbandry (subsequently resigned). Mrs. Howe as Assistant Matron.

In the past year Dr. Fisher took 6 months' leave and during his absence the Senior College Officer, Mr. A. J. Taylor acted as Principal.

Education.

Diploma Courses.—This course was re-opened on 28 January 1946 with 13 Senior and 31 Junior students. Since the resumption of the course, 4 Senior students have left, all in June. These students have qualified for the Diploma. One junior student withdrew from the course.

The total number of students at present attending the course is 9 Senior and 30 Junior students.

Short Courses.—The following short courses were held. The chief purpose was to enrol ex-soldiers (men and women) but civilian applicants were also admitted, provided the requirements of all returned soldiers had already been met.

Date of Commencement.	Course.	Time (weeks).	Soldiers.		Civilians.		Total.
			Men.	Women.	Men.	Women.	
22/8/45.	Instructors' Course	22	19	—	—	—	19
17/9/45.	Farm Engineering	3	7	2	2	—	11
25/9/45.	Seed-Potato Course	3 days	90 Ex	-soldiers	90	Civilians.	
8/10/45.	Crops and Farm Management	2	19	4	5	—	28
22/10/45	Dairying and Pigs	2	30	4	6	2	42
12/11/45	Poultry and Horticulture	3	21	7	4	7	39
4/3/46	General Farming	8	28	4	—	1	33
6/5/46	General Farming	8	23	—	4	—	27
6/8/46	General Farming	8	26	3	2	1	32

Instructors' Course.—Sixteen students completed the course and passed the examinations; three students withdrew from the course before it was completed.

In the case of the short course a number of candidates withdrew their applications before the course commenced.

Hostels.—The hostel is being used for the housing of diploma students. The former trainee-settlers' hostel was opened in February 1946 for the housing of short-course students. It is intended to house senior students next year in the second hostel and junior students in the main hostel.

All the vacancies for 1947 have already been filled by ex-servicemen. Four vacancies for ex-servicemen from Rhodesia have been reserved.

Farmers' Day.—The three-day course for seed-potato growers held in September 1945 was most successful and was attended by growers from all four provinces.

Extension Work.

Under the new division of work in the Department, extension work falls under the Division of Soil Conservation and Extension. In spite of this arrangement the services of College officers are still repeatedly being requested for this work. It is regarded as advisable that officers continue to render these services so that contact with the farmer may be maintained.

The following is a summary of the extension work undertaken during the year:—

Lectures	10
No. of farmers present	500
Visits to farms	370
Shows (judged)	1
Congresses attended	5
Committee meetings	12
Days absent on extension work	140
Visitors to College	700
Articles for "*Farming in South Africa*	5
Press-Service contributions	3
Other articles	2
Radio talks	7
Letters of advice to farmers	4,000

General Review of Conditions during the Year.

The past year was in many respects a most difficult one for the primary producer. Production was hampered not only by climatic conditions but also by the persistent shortage of fertilizer.

In the case of pigs and even of large stock, farmers were often compelled to market half-grown animals.

The rainfall for the year was 10 inches below normal which represents a serious shortage. In the months of July, August, September, November, April, May and June the precipitation was inadequate, with the result that the expected grass crops for the winter and spring did not provide pasturage.

This low rainfall constituted a threat to the water supply, and consequently recourse had to be had to pump water, and the position remains as critical as ever. Plans are being devised for securing a larger storage of water since an increase in the number of students and in the activities will bring with it an even bigger demand.

Soybeans proved a failure; they did not even break through the soil, since the latter was too dry and hot at planting time. The seed was simply choked in the soil.

The shortage of fertilizer and, mainly nitrogenous fertilizer for pastures had a hampering effect on the carrying capacity of the pastures. In order to ensure increased grain production, a few pastures were ploughed and, in spite of the unfavourable weather conditions, satisfactory crops were harvested at relatively low production costs. Other broken-up lands have again been sown to grass in order to retain the balance of the system. One of the largest maize crops for many years was gathered. One silo was filled with maize and another with grass, whereas in the past few years only grass was used for silage. The policy of planting summer legumes is still being

pursued and the College has contributed in no small measure towards the expansion of soybean plantings supplying farmers, as it does, with both seed and inoculation material.

The demand for seed by far exceeds the available supplies.

The dry weather had a favourable effect on the potato crop, in that it curbed diseases.

The production of potatoes was sufficiently large to satisfy all requirements, but vegetables were scarce.

Potato prices were satisfactory throughout the year. Seed potato growers also benefited from the allotment of extra fertilizers by the Price Controller.

The veld-hay crop was poor, but each farmer mowed as much as he could. More farmers resorted to the cutting and stooking of maize. They are thus learning from the bitter experience of the drought.

The shortage of bonemeal had a very adverse effect on the growth of young livestock. The low production of dairy cattle is partly due to the poor dipping materials. The so-called blue tick has multiplied and farmers are complaining bitterly of the inadequate supplies of nicotine sulphate. Red water accounted for many deaths and lumpy-skin disease has been reported from many districts in Natal, but fortunately, the disease has not broken out at the institution.

Farmers seem to realize that the heavy type of horse may yet play a more important rôle on small holdings. An increasing number of mares are being brought in for service and the demand for vaccine against horse-sickness, which is most effective, continues to increase.

The herd of the College is still infected with chronic mastitis, but owing to the fact that penicillin is unobtainable, and that the staff has not reached its full complement, very little can be done in the matter.

Field lupins at Cedara.

Low Temperature Research.

Rees Davies, Superintendent of the Low Temperature Research Laboratory, Cape Town.

THE re-organization of the work of the Laboratory to conform to its normal peace-time functions has already been commenced. The process of conversion will of necessity take time as investigations initiated during the war have to be completed, but the weight that is given to the various projects has also changed in some instances and often priority has to be given to new projects rather than to the resumption of work on suspended projects.

The general food position of the Union has changed considerably during the war. Food production has increased very appreciably, but the demand for food has shown an even greater increase. Whilst the demand for food is maintained, the emphasis on preservation for home consumption will be greater than for preservation for transport overseas. Such a change in emphasis must of necessity have repercussions on the investigations into methods of preservation and on the programme adopted by the Laboratory.

The export of fruit, especially citrus, is rapidly being resumed. It is anticipated that the export of deciduous fruit will recover at a slower pace and may not reach pre-war figures for some years. Storage of fruits will thus form part of the Laboratory's programme of investigation as before, and a start has already been made with citrus-wastage investigations. Vegetable production and consumption have increased greatly in the past few years and the need for developing methods of preservation and for wider distribution of fresh vegetables is becoming urgent. Preservation by chilling, freezing and canning offers scope for wider distribution and for lengthening the marketing period.

The shortage of supplies of meat, dairy products and eggs brings with it the need for long-period storage for local consumption and presents new sorts of problems for investigation.

Rapid developments are already taking place in the fishing industry and the potentialities of this industry are large, but the exploitation of all its resources presents many difficulties.

The Laboratory has facilities for investigating many of the problems in processing and preservation that present themselves to the various food industries. Facilities for investigating storage under chilled conditions, for canning and dehydration, and for investigating the physics and engineering problems of transport are readily available, and steps are being taken to implement the facilities now available for the storage of products in the frozen state. A new block was added to the Laboratory building during the war in order to provide facilities for canning and dehydration investigations. A further building has been planned to provide facilities for quick freezing and frozen storage investigations.

The problem of staff is a pressing one. It does not appear that any real relief can be expected for some time as additional personnel with adequate training and experience of research work in this field are practically unobtainable.

Investigations in Progress.

Dehydration and Canning of Vegetables.

In a fairly comprehensive investigation, comparable samples of various types of vegetables were dehydrated and canned and stored at temperatures ranging from 32°F. to 98°F. The dehydrated product was packed either in air or in inert gases in hermetically sealed tins. The changes in edible and nutritive values during storage have been followed for both the canned and the dehydrated products. The vegetables included in the investigation are green beans, green peas, potatoes, carrots, cauliflower and tomatoes. In several instances variety trials were also incorporated. The storage trials are still in progress for some types of vegetables. It is not possible to present any detailed results here, but the main features of the results can be briefly stated. The canned product proved superior to the comparable dehydrated product in all cases except one—the exception being cauliflower. The dehydrated products in general proved rather disappointing in edible qualities. The losses in nutritive values on storage are complicated by many factors, but it is of interest to record the development of " apparent " Vitamin C in canned green beans after approximately 10 months' storage. The full results of this investigation will be published in the near future.

Enzyme Tests in Blanched Vegetables.

The testing for enzyme destruction in the blanching of vegetables normally follows certain well defined procedures based on rather arbitrary practices. An attempt has been made to evaluate the significance of these tests for various types of vegetables. A critical study of the tests for peroxidases in green beans and the distribution of the enzymes in the bean tissues, is now in print.

Nutritive Value of Fruits and Vegetables.

A survey of the main nutritive constituents of fruits and vegetables grown in the western Cape-Province, or offered for sale on the Cape Town market, has been in progress for approximately a year. The survey was started with the object of providing much needed information on the effects of variety and season on the nutritive values of the most common types of fruits and vegetables.

The nutrients covered in the survey are Vitamin C and carotene. Particular attention was also given to dry weight. The dried material is stored in order to provide composite samples for analysis of the most important mineral constituents. Varietal influences are considerable but the survey will have to be continued for some time before seasonal influences can be evaluated. It is of interest to note that the Vitamin C values of cabbages are generally of the order of 50 per cent. of those quoted for Britain. It is of further interest to mention that the most popular green bean variety for canning has the lowest Vitamin C content of all green bean varieties. It is anticipated that the survey will have to be continued for several years in order to obtain values that are representative of the most important varieties of fruits and vegetables. Sampling is proving very difficult with some fruits and vegetables, whilst the method of preparation of the samples for analysis needs to be varied in order to obtain true values. The survey has also brought to light several interesting new problems, such as the effect of storage temperature on the retention of Vitamin C in potatoes; these problems are being pursued further.

Fish Spoilage.

As a preliminary to a survey of the condition of fish on the inland markets of the Union, the available methods of assessing spoilage have been tested out. The amount of trimethylamine present in the flesh has proved the most promising, the test being simple and fairly rapid. The examination of the flesh for fluorescence offers possibilities with filleted fish, but is of much less value with whole fish or smoked fillets.

Whilst most of the trawled fish landed at Cape Town is less than four days old and the distribution to the inland markets take place almost entirely under ice in refrigerated railway trucks, the necessity of developing a trade in frozen fish has not received much attention. The survey now planned has as its aim the determination of the extent to which the present system of distribution assures consistently high quality fish for the inland markets.

Dehydrated Fish.

Dehydrated stockfish with a shelf-life of at least a year is now possible. The optimum moisture content to give good keeping quality dehydrated stockfish is in the range 14 to 18 per cent. Stockfish dried to low moisture content, i.e. 5 per cent., has a shelf-life of approximately two months only. Packaging of dehydrated stockfish under CO_2 gives a product slightly superior to that packed under nitrogen. Packaging under CO_2 gives rise to the production of a high vacuum in the can owing to the combination of the CO_2 with amine bases in the dehydrated flesh. It is hoped to test out the demand for the product in the country towns that seldom, if ever, receive fresh fish supplies.

Canned Crawfish.

Heat penetration studies have provided data for sterilizing processes for the industry. It is not possible to use high temperatures for sterilization due to the development of cooked flavours and discoloration. The problem of the development of a blue-gray discoloration in the blood vessels after canning is being investigated, as also the production of struvite crystals in the cans.

Citrus Wastage.

The effectiveness of wrappers impregnated with diphenyl in controlling wastage in citrus fruits under various conditions of storage is being investigated. As it is difficult to interpret the results completely, methods of estimating the actual quantity of diphenyl absorbed by the fruit are therefore being tried out. It is hoped that such data might assist in interpreting the results of storage tests.

Food Yeast.

Following on the investigation of the technique of food-yeast production carried out at the Laboratory some two years ago, the Laboratory provides technical advice to the Food Yeast Development Co. in the operation of its semi-commercial plant at Durban. Considerable progress has been made and the collection of data for full-scale production has virtually been completed.

Farming in the Winter-Rainfall Area.

J. S. Marais, B.A., Ph.D., Principal, Stellenbosch-Elsenburg College of Agriculture, University of Stellenbosch.

DURING the past year a commencement was made with the re-establishment of the normal activities of the Institution. The diploma course was resumed and a series of short courses held. Serious attempts are being made to improve the farms and renovate the equipment of the Institution and so wipe out all traces of the neglect which was inevitable during the war years.

Soil Conservation and Crop Rotation.

A most gratifying feature is the awakening of the farming community to the urgent need for soil erosion control, in consequence of which the work was carried out at an increased tempo during the last winter. Actually the works so far completed, represent only a small portion of what still remains to be done, but nevertheless, a good start has been made. The coming year will probably witness greater activity in this field.

The lucerne-subsidy scheme has not enjoyed the support originally expected. Approximately 5,000 morgen of lucerne were established by 123 landowners, the bulk of the lucerne having been sown in the Caledon-Bredasdorp districts. The particularly unfavourable season was probably a big contributory factor, but was not the sole reason for the lack of interest. Farmers do not seem to be sufficiently alive to the importance of lucerne in a system of rotational cropping, and tend to rely on one or two lucerne paddocks for improving the grazing on their farms.

Climatic Conditions.

Farmers have had to contend with varying climatic conditions. The western Cape Province experienced a particularly dry year and the second half of the summer was exceptionally hot. Nevertheless, the grape harvest was satisfactory, and a good market existed for wine; in fact, it was bigger than ever before. It is felt, however, that the present large-scale production of wine is likely to create marketing difficulties in the near future. Greater attention will have to be paid to the quality of the product in order that the industry may successfully compete abroad.

The excessive rainfall during the first half of the winter of 1945 and the scanty rainfall during spring, are the cause of the poor grain crops. Only in the Swellednam-Heidelberg-Riversdale area, which is normally not regarded as a reliable grain-producing area, were good grain crops produced. In the Caledon-Bredasdorp area, root-rot disease caused extensive damage, and it is estimated that 30 to 40 per cent. of the crop was destroyed by this disease. The donation by the Wheat Control Board of a hot-house, as well as funds for the appointment of additional staff to investigate the disease, is therefore greatly appreciated.

This year the grain crop looks very promising in the Swartland, but is poor in Caledon and Bredasdorp and a failure in Swellendam-Riversdale.

The vegetable industry suffered a severe setback owing to the decreased purchases on the part of the canning factories for canning purposes. Consequently, there was a large surplus of cabbage, cauliflower, turnips, carrots, etc., on the market during the past few months, and many farmers used vegetables of excellent quality

as green feed for their animals because the harvesting and marketing costs were higher than the obtainable prices.

In the field of animal husbandry matters have not been too favourable either. Due to the summer drought, grazing was very limited and lucerne hay and concentrates were extremely scarce. This scarcity affected dairy products in particular. Poultry production decreased considerably owing to the shortage of feed. Many farmers have been compelled to curtail their concerns to a considerable extent.

Prices of horses and mules dropped, owing to the improvement in the fuel position and as soon as tractors and lorries become readily available again, a further drop may be expected. The shortage of labour and the poor quality of farm labour are forcing farmers to apply mechanization, and only the shortage of machinery is delaying a large-scale switch-over.

Education.

The re-opening of the agricultural colleges for the education of prospective farmers has met with great apporval. There are 43 first-year students in the Diploma Course, and 11 ex-volunteers attended the 6 months' practical course. Already there are more than 50 applications for admission to the diploma course in 1947, of which a limited number only can be accepted. Plans are, however, being devised for extending the accommodation facilities.

The attendance at the short courses was very satisfactory.

The degree courses in Agriculture and Forestry are being particularly well attended. A striking feature, however, is the unsatisfactory nature of the training given at schools preparatory to these courses. The number of students who fail in the first year is consistently over 50 per cent., and has already been as high as 75 per cent. In 1946, 209 degree-students were enrolled, of which 98 were in the first year, 44 in the second year, 35 in the third year and 17 in the fourth year. There are 15 post-graduate students. In the Department of Forestry, there are 51 registered students. During the past year the following university degrees and diplomas were awarded.

Agriculture: Doctors' degrees 2; Masters' degrees 5, and Baccalaureus degrees 25.

Domestic Science: Baccalaureus degrees 5; Diplomas in Domestic Science 16.

Extension Work.

Much time was devoted to the extension work. About 5,000 requests for information were answered by letter; 75 farmers' meetings were addressed, and attended by approximately 3,000 people. Judging at shows was carried out 44 times, and altogether, 555 farmers were visited, apart from inspections in connection with bacterial blight and the lucerne-subsidy scheme.

Nowadays a good deal of instruction is obtained telephonically and by way of visits by farmers to the Institution. No record is kept of these.

During the past year in particular, a large number of applications have been received for advice in connection with the purchase of farms. Farms are being purchased extensively, particularly by city dwellers, and in most cases uneconomical prices are being paid. Many of the buyers seek advice in connection with their purchases from this Institution. The policy followed is never to state the monetary value of the property, but only to give information in regard to the suitability of farms for the production of various products. An alarming feature, however, is that most farms are being purchased at exorbitant prices.

Research.

In all sections of the Institution research is hampered by a shortage of personnel. The education of students dare not be neglected and all applications for information have to be dealt with in full; consequently, the shortage of personnel has an exceedingly adverse effect on research.

Animal Husbandry.

The Animal husbandry section paid particular attention to research in connection with the feeding of locally-produced feeds, in order to supplement the shortage of concentrates. Acorns, oats, silage manufactured from lucerne, lupins and oats, and lucerne grazing, have all been tested out as possible substitutes for mealie meal and protein concentrates. Valuable results have been obtained for practical purposes. In this connection the economic production of baconers received special attention. The baconers were slaughtered, and the carcase measurements taken. At the same time the preparation of bacon was tested out in order to determine the quality of the baconers and the breeding results. Excellent and valuable results were obtained.

Attempts are still being made to develop a new mutton breed in which the virtues of both the Dorset Horn and the German Merino are united and certain defects of both strains eliminated. Satisfactory progress has already been made. The Frisian, Jersey, Percheron and German Merino stud farms have been developed to first-rate concerns. The production from dairy cattle is excellent.

Agronomy.

In the sphere of agronomy, research has been aimed mainly at the development of farming systems which make conservation farming possible. Various systems of rotational cropping are being tested out and the inclusion of dryland lucerne in a system has brought a great improvement.

In co-operation with the plant breeding and plant pathology divisions, breeding and selection work is continually being carried out to obtain improved varieties of cereals, fodder crops and legumes. All these new varieties are tested for quality, resistance to disease and yielding capacity. In addition, an extensive study is being made of the milling and baking qualities of wheat varieties. The breeding results with wheat are hampered by root-rot diseases, especially by *Ophiobolus graminis*, which apparently damages all the existing varieties.

A considerable amount of attention is paid to the influence of manure, straw and various systems of soil cultivation on grain yields. Here too, surprisingly large differences in yields have been observed. Chemists are attempting to find explanations for these phenomena by tracing the processes governing nutrification and those by which plant nutrients are made available in the soil. These results are of great importance for practical purposes.

On the Cape Flats experiment farm, good progress has been made in a study of different vegetable varieties, methods of cultivation, rate of seeding, and spacing. Gradually, information is being obtained which will eventually create order out of the chaos of varieties offered by the trade, and vegetable producers will be able to receive guidance of infinite value. The progress made in the purifying of varieties and in the cultivation of certified seed, indicates that most types of vegetables will soon be independent of imported seed. During the past five years preliminary preparations

have been carried out which will serve as a foundation for future research in connection with vegetables.

Viticultural Oenology.—Studies in connection with fertilization, soil cultivation and variety are being continued, since the results obtained, indicate that the industry can derive great benefit from such studies. Experiments in connection with topping have been discontinued since there is ample evidence that certain methods of topping are outstanding. A series of viticultural experiments has been started in co-operation with the K.W.V. All the vineyards are well established and were pruned, trellised, pre-thinned and tied up by officers of the Institute. Most of the vines have reached the bearing stage and preparations have been made for commencing wine-making, in 1947. It is considered desirable to collect all the various types of wines at the Institute to render possible an accurate study of the quality and the aging of the wine.

In wine-making, further attention was paid to the fortifying of good dry red wine. The blending of Gamay with Pontac and of Mataro with certain other types, is particularly promising. The duration of the vatting period in the making of types of red table-wine, with a view to colour and character, has been investigated, and it appears that an overrated value is attached to long vatting of the husks. In another series of experiments a comparison was made between the settling and non-settling methods in the making of white table-wine. Although the settling method yields a smaller percentage of good wine, it appears that such wine is finer than that made without settling.

Experiments are also being carried out with the making of sweet white wine types (White Port wine). Good progress has been made and promising results have been obtained.

In the laboratory a considerable amount of attention was paid to methods of analysis of wine and brandy and various methods of fining were tested out on a small scale.

The maturing of brandy is being investigated in co-operation with K.W.V. at Stellenbosch and at Robertson. A large number of samples of rebate brandy, spirits and mixtures of the two are being stored and sampled and analysed at fixed periods to investigate the changes in composition due to maturing. All vats are carefully weighed in order to determine the loss in evaporation.

In spite of the comprehensive experiments which are being carried out at present, it is felt that as yet the oenological problems awaiting solution, have been approached only tentatively. The peaceful research atmosphere is lacking, since, due to shortage of personnel, the officers have to perform administrative and routine duties as well as give lectures, besides their research.

Chemistry.

Besides the chemical research which is being carried out in co-operation with the division of Agronomy in connection with experiments on rotational cropping and cultivation, there is a series of projects in which special investigation is being made to determine immobilization of phosphates in various types of soil in the Swartland. Particularly valuable results have been obtained, which indicate that the chemical composition of the available forms of phosphate is an important factor in their value as fertilizer on various types of soil. A study has recently been completed of the availability of nitrogen in a series of organic fertilizers, and the results are being prepared for publication.

Results of great value were obtained in the supplementing of the shortage of manganese on the Cape Flats. Where farmers formerly used up to 40 tons of manure per morgen, it has now been found that 10 to 15 tons of manure are ample if manganese sulphate is added. Vegetable farmers cannot obtain sufficient quantities of manure for their industry and these results are therefore of great economic value, and create the possibility of putting soils which have already become useless, under economical cultivation again.

The use of so-called "starter" solutions was tested out with tomatoes, and it was proved that this method of applying fertilizer yields excellent results. Not only is there a saving in artificial fertilizer accompanied by larger yields, but the crops are accelerated to a considerable extent.

Plant Pathology.

After years of research, a textbook for farmers, on vine diseases, is being compiled, and will soon be ready for publication.

Studies in connection with the control of a leaf-spot disease, roetvlek, in sultanas growing in the irrigation areas along the Orange and Olifants Rivers, which has now made its appearance in Worcester, are being investigated, and the previously unknown causal fungus has been isolated and described. Possible remedies for the control of the disease are being investigated.

A considerable amount of preliminary work must still be carried out before it will be possible to form a clear conception of the organisms contributing to root-rot disease occurring on such a large scale in the grain districts. The fungus *Ophiobolus graminis*, is apparently the main cause, although various species of Fusarium, *Helminthosporium sativum* and *Wojnowicia graminis* also play an important rôle. Various experiments are being undertaken for determining the influence or organic matter, artificial fertilizer and soil structure on the damage brought about by the causal organisms. Disinfectants for the control of the disease are being tested.

Meanwhile "root-rot gardens" are being established which serve as a culture base for a large number of wheat varieties and selections which are cultivated with a view to choosing possible resistant selections which may serve as breeding material for resistant varieties.

As can be noticed, this work is still in the commencing stage, and is being performed largely with money made available by the Wheat Industry Control Board.

The investigation into vegetable diseases of which there are a large number requiring attention, is being carried out by only one officer. Among the diseases being investigated are *Rhizoctonia solani* in beans, *Oidium* in musk melons and late squashes, dying off in beans and stem rot in sweet potatoes.

The survey of bacterial blight in vineyards and nurseries is being continued. More than 24 million vines and more than 4 million grafted vines have been inspected. At Somerset West three new infections were diagnosed. Prof. Verwoerd is also the co-ordinating officer for the western Cape Province in the certifying of seed potatoes.

Entomology.

The entomological personnel is totally inadequate for the investigation of the multiplicity of pests about which farmers are continually seeking advice; consequently there is no time for an

uninterrupted thorough investigation of the individual pests. One pest after another undergoes a preliminary investigation until a fairly good insecticide is found, and then another urgent pest has to receive immediate attention.

Nevertheless, a considerable amount of attention is being paid to cutworms, of which *Euxoa subalba* Walk, appears to be the most important. Last February it was found that more than 100,000 cutworms were present on a potato land on the Cape Flats. Bran which is an important ingredient of the best bait thus far used, is unobtainable to-day, and new baits are being tested out.

Surveys of eelworms, *Heterodera marioni*, (Coruu) Goodey, and *Heterodera schachtii*, Schmidt, were made on the Cape Flats. After the tomato crop during the summer of 1944-45, the land was sown to carrots and beetroot in April. The plants were so badly attacked by eelworms, that there was no crop. Immediately after the winter, Long Tom beans were planted, but the infection was slight and when carrots and beetroot were again sown in February, 1946, the crops were damaged so slightly, that a normal stand was obtained.

This peculiar phenomenon is still awaiting an explanation.

Attention has also been given to the control of the Mole Cricket, *Gryllotalpa sp.*, the vegetable beetle, *Bagrada hilanis*, Burm; the black beetle, *Heteronychus arator*, Fabr; the tomato caterpillar, *Heliothis armigera*, Hutu: the small tuber moth, *Gnorimoschema operculella*, *Zell;* the aphid of carrots, *Cavariella capreac*, Fab.; the wheat louse, *Toxiphera graminum*, Rhoud.

Treatments with D.D.T. for the control of house and stable flies, lice on stocks, and fleas were applied with great success.

Plant Breeding.

Apart from the breeding of cereals of which mention has already been made, breeding and selection work is also being carried out with clovers and lupins. Varieties of the latter have been developed, which shows practically no lignification in the seed. Lupins are expected to be a valuable fodder crop and green-manuring crop in orchards and vineyards.

Excellent results were obtained from pure strains of rye developed through self-pollination. Synthesis of commercial rye varieties is necessary in order to make good use of the pure strains.

Extraordinary results are obtained from wheat x agropyrum hybrids and high expectations are cherished from this material for the breeding of types which will be able to resist disease.

Good progress was made in the improvement of various types of vegetables such as Cape Spitzkool, carrots, beetroot, tomatoes and onions.

Poultry Breeding, Dairying and Agricultural Economics.

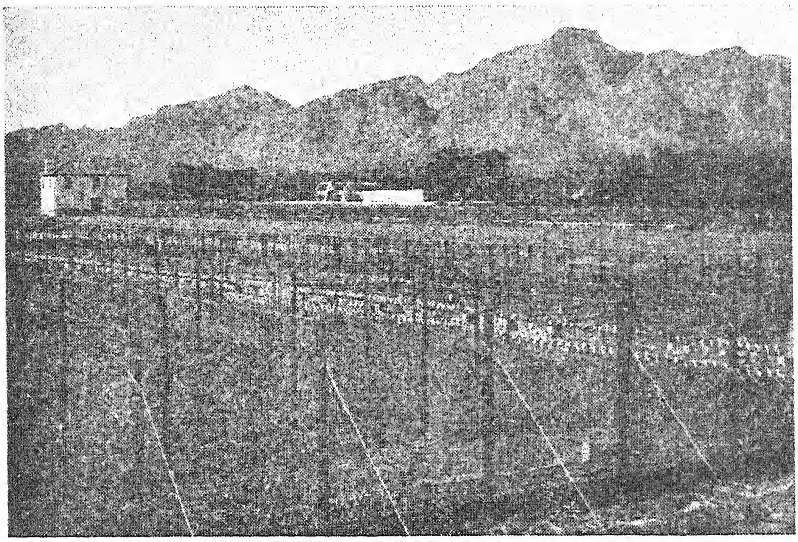
The technical personnel of the former two sections have had to cope with such a large amount of lecturing and extension work, that there has been little opportunity for any constructive research.

The two officers of the division of Economics could only be of assistance to the Division of Economics and Markets in a study of the production costs of eggs and day-old chicks, and the Farm Book-keeping system. The lecturing takes up the greater portion of their time.

Improving the Fruit Industry.

R. I. Nel, D.Sc. (Agric.), Acting Director, Western Province Fruit Research Station, Stellenbosch.

Perhaps no other branch of farming in the Union felt the impact of the war as acutely and needed more technical assistance and guidance than the deciduous fruit industry. To-day, the Department can pride itself on the services rendered to the industry by the Fruit Research Station during the difficult years of war—a success which is mainly due to the efforts of the first Director of the Institute, Dr. M. S. du Toit, who in August, 1946, was appointed Under-Secretary for Agriculture. Under his constructive administration and inspiring guidance the Fruit Research Station developed not only



View of experiment farm at Bien Donne (W.P. Fruit Research Station) with strawberry breeding enclosure in foreground.

into a source of practical guidance and technical assistance to the fruit farmer but also into one of the leading institutions of its kind in the world. In the course of the year under review Dr. du Toit, at the instance of the Department, instituted a thorough investigation into the research and marketing problems with which the deciduous fruit industry is confronted in Britain, Canada, Australia and the United States of America, and the industry will benefit greatly from the results of this investigation. The services rendered to the fruit industry and the most important technical activities of the Fruit Research Station are recapitulated below.

Enlightenment and Technical Advice.

New milestones have been reached in the sphere of providing practical enlightenment and technical advice not only to farmers but also to factories and bodies interested in the fruit industry. In addition to a big farmers' day on the experiment farm, Bienne Donne, which was opened by the Minister of Agriculture and attended by about 600 fruit farmers, smaller farmers' days were held at Villiersdorp, De Doorns and Joubertina, and a short course in pomology was held at the Stellenbosch-Elsenburg College of Agri-

culture. Further, 110 farmers' meetings, attended by 2,571 fruit-growers, were addressed. The laboratories, offices and experiment farms were visited by 1,627 interested persons. Not only was much information supplied per telephone but a large number of advisory letters were also written to farmers. As reflected by the total of 2,659 farms visited during the year there was an exceptionally keen demand for the investigation of cultural and other practical farming problems, especially on the part of new farm-owners. There remains, however, a considerable need for specialized enlightenment in the outlying districts both as regards problems of quality and cultural difficulties, which could not yet be met.

As in the past much time was devoted to technical advice to the Deciduous and Dried Fruit Control Boards and their committees, *inter alia*, on matters such as grading, packing, transportation, storage and marketing problems. The meetings held by these bodies were always attended by a member of this Institution.

Technical advice was once again given on a considerable scale to canning and dehydration factories, packers of dried fruits, manufacturers of sprays and dusting materials for which purpose investigation and experiments are being carried out.

Assistance to other Divisions and Departments includes, *inter alia*, 3,172 notices issued and 270 letters written on behalf of the Controller of Fertilizers; approval of bulls and inspection of potatoes in the Ceres-Tulbagh, Worcester-Robertson areas for the Division of Soil Conservation and Extension, a survey of the mineral and vitamin A and C contents of vegetables in the Knysna area for the local Health Centre and spectro-chemical analyses for the Division of Horticulture.

Co-operative Demonstration Experiments.

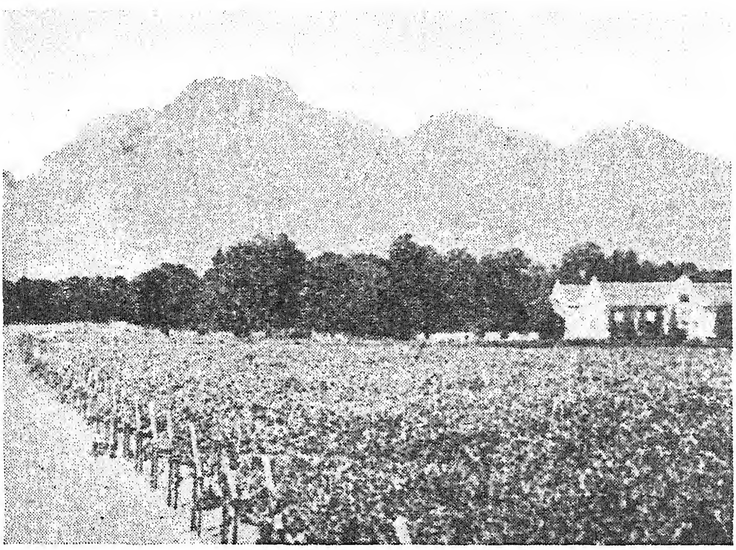
Experiments on farms are regarded as the best method of demonstrating the applicability of a cultural practice or the suitability of a variety for a certain area. In all, there are 143 co-operative experiments under way in connection with the following subjects: rootstock types for deciduous fruit varieties; suitability of areas for varieties of deciduous, sub-tropical and berry fruits; orchard practices such as pruning, thinning, grafting, etc., vine rootstocks and varieties, spraying against delayed foliation, hormone sprays against drop of apples; control of manganese and zinc deficiency and chlorosis in various tree and berry fruits; control of fusicladium and peach mildew; control of calandra, woolly aphids, ants, fig scale, codling-moth in apricots, codling-moth spraying experiments and leaf-scald in apples, biological and chemo-biological control of codling-moth infestation (parasite cum spraying method), irrigation and drainage, reclamation of brackish soil and packing and storage of dried fruit.

Although a considerable number of experiments are already being conducted outside the better-known fruit areas, *inter alia*, in Clanwilliam, Van Rhynsdorp, Ladismith, Barrydale, Swellendam, Uniondale, Stanford-Napier, etc., there are still many centres awaiting such experimentation.

Research.

Climatic Studies.—With the recently completed improvements, the Institute has now at its disposal an exceptionally well-equipped meteorological observatory with good facilities for agro-meteorological research. A basic part of the work comprises the making of detailed climatological observations at the central observatory and also the collection of meteorological data at 12 sub-stations in the leading

fruit areas. A report on these data is written annually and is at the disposal of other Divisions as well. The practical advantages of the survey and classification of the fruit-producing areas include the recommendation with much more certainty of the most suitable varieties for a specific locality, the elimination of climatically unsuitable and consequently, unprofitable varieties, the timely application of measures against delayed foliation, facilitation of the application of spraying programmes at the proper time, etc. Problems to which special attention was paid during the past few years were, *inter alia*, summer climate in its relation to cultivation and quality of deciduous fruit and the effect of winter temperatures on fruit production.



Portion of the vineyard fertilizing experiments at Bien Donne, Groot Drakenstein (W.P. Fruit Research Station.)

Pomological Investigations.

From a pomological point of view the problem of climatic unsuitability of varieties as revealed in the phenomenon known as delayed foliation is approached mainly along three lines, viz. (1) the application of direct measures of control on existing plantations; (2) the testing of varieties for determining their resistance to delayed foliation; and (3) the investigation of methods for replacing undesirable varieties by more suitable varieties.

Control of Delayed Foliation.

The effect of the time of pruning on delayed foliation was investigated for the fourth season in Peregrine and Early Dawn peaches. Late pruning again induced a 100 per cent. increase in yield as compared with early pruning. A further series of experiments were laid out in connection with oil sprays against delayed foliation in prunes, apples and pears, mainly with a view to establishing the most suitable time of application and the usefulness of adding dinitro-cresol to the oil emulsions.

Varietal Studies.

(*a*) *Deciduous Fruits*.—The variety trial orchards at Bien Donne which comprise more than 300 peach, pear and plum varieties and

include new selections as well as newly-imported types and standard varieties under cultivation, are making excellent progress. The peach trees should bear a reasonable initial crop this year. Once more there was a heavy demand for the mid-season desert peach "Boland" which was issued by the Institute last year. This variety is exceptionally resistant to delayed foliation.

(*b*) *Sub-tropical Fruits.*—Of the various sub-tropical species and varieties of fruit which are being tested at the experiment farm and in the outlying districts, the avocado, guava, fig, olive and pecan nut seem to offer the best prospects. Regular notes are made on yield, ripening season and quality.

(*c*) *Berry Fruits.*—As a result of the growing interest in berries, the experimental work has been considerably expanded. Experiment plots have been laid out in the Koue Bokkeveld, Ceres, Elgin, Houwhoek, Napier, Wellington and Stellenbosch, where several varieties of strawberries and brambles are tested. On the experiment farm, Bien Donne, various cultural methods are being tested. So far, results from the extensive bramble experiments seem to indicate that the thornless Young-berry produces the highest and the Low-berry the lowest yields, whereas the Boysen-berry appears to possess the highest commercial factory value. Extensive experimental work on Gooseberries was conducted at Bien Donne. The ordinary Cape Gooseberry (*Physalis peruviana*) appears to be superior in all respects to *Physalis ixocarpa* which is also being cultivated in certain parts of the country. A new type, *Physalis pubescens*, has also been planted. Since there are no standard varieties or selections of the Cape Gooseberry, notes on individual plants are made with a view to a selection of the best types.

Experiments with Top-working and Rootstock Types.

The results of three co-operative experiments in which 7 to 8 methods of top-working of apples and pears were compared show that, while stub-grafting is the most expensive method (viz. 2s. to 5s. per tree, according to size), it is, nevertheless, the most economic method because of its early crop and high yield. These findings are especially important to growers who wish to replace unprofitable varieties by more remunerative varieties.

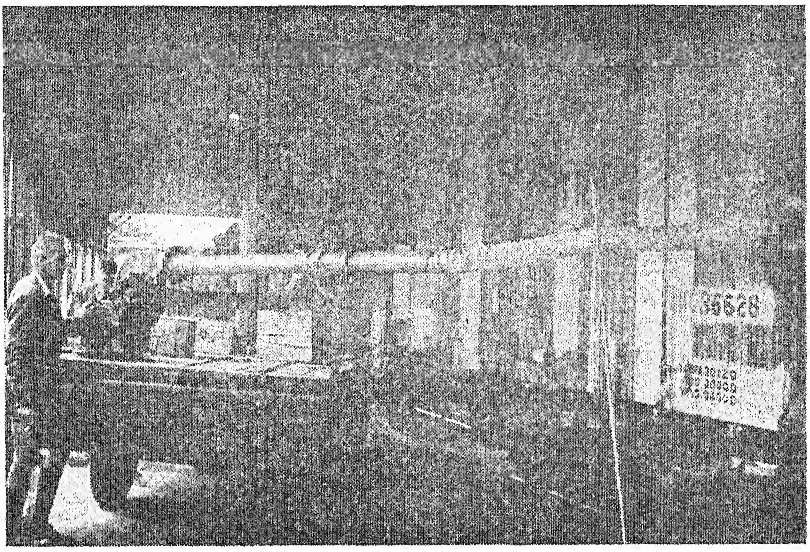
The experiments on the testing of rootstocks are progressing favourably. The mother plantation is now being transferred from the University farm "Welgevallen" to Groot Drakenstein and for the next two years experimental work will necessarily have to be conducted on a limited scale. Pruning tests are being continued and new pruning demonstration plots have been laid out. Experiments on the pollination of pears have once again been resumed.

Cultivation of Table Grapes.

Ampelographic Work.—The detailed studies on the growth, cultivation and production of the 16 more important commercial varieties were continued. In addition, comparative studies including the quality and marketability as well as growth and bearing characteristics were again conducted on about 150 table grape varieties in the ampelographic collection.

Pruning and Topping Experiments.—The experiments on the time of pruning of Waltham Cross grapes have now been concluded after the sixth season, and the results are being prepared for publication. In Red Muscadel the results obtained over a period of five years show that clearing followed by a final pruning in August is the best treatment and that the time of ripening is largely determined by the time of the final pruning rather than that of the clearing. In Red

Hanepoot, preliminary experiments show that a clearing and final pruning should be performed simultaneously during the second half of August and long bearers be left with the necessary short ones without bending the shoots. In a five-year topping experiment with Alphonse Lavallée, tipping proved the most beneficial treatment as compared with severe and moderate topping—a practice which is especially recommended in the case of the verandah trellis.



Fumigation of grapes with sulphur dioxide in the truck. Grapes treated in this way arrived at inland markets in prime condition.

Shoot Growth and Thinning of Bunches.

Studies on the growth of the grape vine were continued with special reference to periodicity of shoot growth, time of budding and blossoming of varieties and increase in volume in the developing grape bunch. In addition, considerable attention was given to the question of poor fertilization in Waltham Cross, one of the most serious problems confronting the Paarl table-grape grower.

In experiments on the most suitable time for thinning of surplus bunches, thinning prior to the blossoming period proved most beneficial in the case of White Hanepoot, and may mean an additional income of almost £14 per morgen to the farmer. The experiments yielded most interesting data on the various methods of thinning bunches and producing grapes of superior quality.

In experimentss on top working of vines (Gros Colmar) to new species (Alphonse Lavallée) cleft grafting in which 91·6 per cent. of the scions took, proved far superior to the Jardine method and tongue grafting.

Progress in Breeding.

In the case of almost every kind of fruit there is no need for varieties which are better adapted to specific climatic regions, more resistant to specific diseases, and which mature either earlier or later and have a better keeping quality than the types available. The question of better quality virtually constitutes one of the most acute problems in the reconstruction of the fruit industry. This year attention was focussed mainly on guavas and extensive observations were made on quantitative and qualitative properties in about 5,000 individual hybrid trees raised from seed. In the case of strawberries

similar data are being collected from 5,000 hybrids, and a further 1,000 crosses have been planted out. In the case of peaches 50 new crosses have been planted out, but in the case of grapes and apples no new crosses were made. Hundreds of hybrids from previous crosses of these fruits are under observation.

Physiological Investigations.

Premature drop of apples near harvesting time presents an important problem in the Elgin area and experiments were continued on the efficiency of hormone sprays in preventing drop, Alpha-napthalene acetic acid and certain hormone sprays gave satisfactory results. In the experiments as much as 20 per cent, sound fruit, which would normally have been blown off, was saved. This rendered the spraying quite profitable.

Extensive experiments are under way in connection with the nutritional requirements of various fruits. Special attention is being paid to deficiencies of manganese and zinc and to methods by which the condition can be remedied. No symptoms indicative of malnutrition have so far been definitely determined for guavas. Sand cultures are used for these determinations.

Experiments are under way in connection with root development in olive slips when treated with hormones.

Investigations of Plant Nutrition, and Soil Fertility.

Spectro-chemical investigation of nutritional deficiencies.—As a result of the comprehensive nature of the results and the accuracy and greater speed and facility with which determinations can be made, spectro-chemical analysis is being increasingly employed in determining nutritional deficiencies in plants. Specific methods entailing considerable pure spectro-chemical research have been devised for this purpose and the Institute is in the vanguard in the application of this method for agricultural purposes.

Apart from routine analyses in connection with physiological experimental projects and samples submitted by farmers for diagnosis, an extensive study was made of the change in concentration of elements in the vine leaf during the growing season on the basis of samples from various fertilizer plots. The results of the first year show that: (*a*) manganese concentrations remain constant; (*b*) potassium, phosphorus and magnesium decrease; (*c*) aluminium, iron and calcium increase considerably; and (*d*) concentrations of boron vary and show no definite tendency.

Fertilizer Experiments.—Owing to the resignation of the officer responsible for the fertilizer experiments, the work was considerably retarded and some experiments, e.g. those on apples, had to be temporarily discontinued. The experiments on berries, prunes and grapes yielded most interesting results but final conclusions will only be possible in a few years' time. A noteworthy result is the exceptionally strong response of orchard cover crops to nitrogen applications and, to a lesser extent, to phosphate; this finding is of great importance in connection with soil conservation and throws into relief still further the difficulties in respect of artificial fertilizer at present experienced by fruit and grape-farmers.

Irrigation and Moisture Conservation Experiments.

The vines specially planted for these experiments have now reached an age where the actual irrigation experiments can be commenced. Uniformity experiments in which the thickness and weight of shoots and the yield of individual vines were taken, have already been carried out by way of preparation. In consequence of the shortage

of staff due to resignations, fundamental studies on the moisture requirements of fruit trees, conservation methods, etc., have had to be discontinued until conditions improve. This is most unfortunate, since irrigation is of basic importance in fruit production and plays an important rôle in the wintering of trees, yield, grade and quality of fruit. The brack or alkaline problem, too, should receive more attention.

Investigation on Picking, Storage and Transport of Fruit.

Comprehensive studies were again conducted in connection with the factors influencing the standard and keeping quality of the various kinds of fruit and the best treatments for ensuring a long storage life.

Apples.—The bio-chemical changes in the fruit during its development in the orchard, the influence of climatic conditions and the stage of picking have been determined for the most important commercial varieties, especially with a view to the present storage difficulties which result in considerable annual losses. In consequence of these studies, "bitterpit" graphs have been plotted and with the aid of these the possible susceptibility to bitterpit can be predicted as early as January. An important finding is that, in practice, farmers pick from 4 to 6 weeks too early and that in consequence, a 20 per cent. loss in weight, pronounced susceptibility to bitterpit and scald, shrinkage and loss of colour, aroma and taste result during storage or marketing. Apples picked at the right time can be stored in perfect condition for very long periods, at low temperatures (31° to 30° F.).

Pears.—Similar experiments were conducted this year with Bon Chretien and Packham's Triumph, with this difference, however, that the influence on canning qualities also constituted part of the experiments. During the fortnight preceding picking, the weight increases by about 30 per cent., and thus if pears are harvested at too immature a stage a serious loss may be experienced. Apart from storage temperature, ripening temperature is also an important factor. Whereas these pear varieties ripen unevenly at higher ripening temperatures and become watery and tasteless, they develop a high quality at 55° F. and retain their eating and canning qualities for a relatively long period.

Grapes.—In view of the high losses from wastage in grapes on the local market, detailed investigational work was carried out (*a*) to determine the factors and conditions causing this wastage and (*b*) to develop methods, such as gas treatment, for its control. In this connection officers of the Institute travelled in fruit trains to Durban and Johannesburg and studied conditions in trucks of various types. In addition, they investigated specific marketing difficulties and complaints.

In continuation of previous experiments on the control of wastage by the spraying of wood wool with a solution of sodium bi-sulphite and exposure to sulphur dioxide gas, methods were developed for successfully treating trucks of packed grapes under relatively high temperatures, with sulphur dioxide gas. In this manner the gassing of large consignments by these methods resulted in an effective control of wastage and a remarkable lengthening of the period of marketability. In other experiments where grapes, after an exposure to gas or spray, were held in cold storage at 31° F. and again treated periodically, the fruit was kept in a very satisfactory condition for 4 to 5 months. These out-of-season grapes fetched exceptionally high prices on the Johannesburg market. These experiments are, from a practical point of view, of the utmost significance to the grape-farmer.

Entomological Investigations.

(1) *Codling Moth.*—Owing to a cool autumn and an improvement in spray supplies, a far more satisfactory control of the pest was obtained on both apples and pears, than during the previous year, in spite of the fact that the crop was very light, particularly in the case of pears. As regards apricots, too, the position was more favourable, partly in consequence of the increasing practice of spraying with fixed nicotine. During the past season, infestation of prunes was once again very severe in the Tulbagh area. In the meantime it has been definitely established that the fruit is attacked by a predominantly one-generation strain of the pest, as in the case of apricots—a fact which will facilitate control.

The long-term spraying experiment to control the codling moth and spray injury in apples, was continued. Arsenate of lead again induced considerable leaf scald and leaf drop. Oil injury began to show up, indicating that the continued use of summer oil emulsions on apples, definitely holds some danger. The special advantages which spray programmes with fixed nicotine offer to apple growers, were once again evident. A spray programme including cryolite, gave most promising results. Two proprietary brands of fixed nicotine were tested out against each other on pears and a preliminary test was carried out with a new organic spray containing benzine hexachloride.

Control experiments were continued on apricots with sprays and dusts including materials containing the insecticides D.D.T. and benzine hexachloride. The results indicate that dusting can apparently be successfully applied against codling moth on apricots—a finding of great practical significance in the drier areas—and that D.D.T. is promising both as a spray and as a dust. The replacement of fixed nicotine by D.D.T. can, however, not be recommended as yet.

Moth control experiments in prunes have been commenced.

Biological Control of Codling Moth.—This project received considerable attention and made good progress. At the beginning of the year under review it became possible to occupy the parasite laboratory partially and to expand the breeding of parasites considerably. The false codling moth is still mainly used as host, and more than seven million of these insects have been bred. The methods developed by the Institute have aroused keen interest overseas and institutes in California and Australia have asked for full particulars. A visiting entomologist from England requested permission to send out a technician shortly to receive special instruction in our methods. Trouble is still being experienced with the mass breeding of certain specific parasites and with the aquirement of desirable parasites from abroad.

Parasite liberations were extended and experiments with the parasite cum spray method were repeated. With 3 to 4 sprays of fixed nicotine plus the employment of parasites, infestations of 12·4 per cent. (Nieuwedorp experiment) and 26·1 per cent. (Rhone experiment) were obtained, as against infestations of 15 per cent. to 50 per cent. in adjoining orchards where the full spray programme with fixed nicotine and summer oil emulsions (9 to 10 sprays) was carried out. These results are regarded as most promising.

Other Orchard Pests.—The activities of other orchard pests, such as the fruit nibbler, the pear bud mite, scale insects, the Bryobia mite, woolly aphis in apples, etc., were carried out on a normal scale. Black peach aphids, however, occurred on an exceptionally severe scale in September and October 1945 and more often than not control measures could not be applied because of lack of nicotine sulphate.

Considerable damage was caused. Mediterranean and Natal fruit flies were very active too and caused considerable damage, especially in grapes. Owing to the shortage of white sugar, which is recommended for the preparation of the poison bait, control was seriously hampered. Preliminary studies on various olive pests were carried out and control measures tested out.

Vine Pests.—Mealy bug infestations occurred on an exceptionally light scale, partly as a result of unfavourable weather conditions and partly as a result of intensive ant control campaigns, which were generally initiated. Other vine pests, with the exception of the fruit fly already mentioned, occurred on a normal scale, or to a lesser extent than during the previous year and did not result in much damage in those cases where proper control measures were applied.

Laboratory Studies.—Considerable attention was given to insecticides and toxicological studies. New directions of study include the effect of insecticides on the natural enemies of pests and of the factors which may render selective use of insecticides possible. The experiments included, *inter alia,* the testing of the relative toxicity of a series of insecticides against one of the codling moth parasites. In addition, a comparative study was made of the pH of the digestive juices and the enzyme contents of the gastric juices of the codling moth, of the false codling moth and of certain parasites, with the ultimate aim of developing poisons injurous to the pest but harmless or less injurious to its natural enemies. Important results have been obtained. In addition, conventional toxicological experiments were carried out on a series of insect pests in which the newest insecticides were tested. This work is being continued.

Other studies included the biological forms of the pear mite, *Eriophyes piri,* morphological differences between the larvae of the codling moth and false codling moth, and treatments in connection with the keeping qualities of host larvae in parasite breeding.

Diseases in Orchards and Vineyards.

Owing to the serious shortage of staff, the plant pathological work had to be reduced to a minimum. Intended new research work on scab in apples (*Venturia inaequalis*) had to be dropped. Spray programmes, which fit in with those used against the codling moth, have been devised and a detailed report on the investigations to date has been drafted.

Peach mildew (*Oidium leucoconium*) is still viewed in a most serious light and research has been continued. Experiments again revealed that the occurrence of the disease on the fruit itself can be avoided by the application of a lime-sulphur spray in winter. This treatment is not effective against the disease on young shoots, even when followed by various summer sprays with lime-sulphur. A dinitro-cresylate spray yielded no significantly better results than lime-sulphur. Summer treatments are essential for the control of the disease on leaves and sulphur dustings yielded much better results than lime-sulphur sprays. The investigation of bacterial blight in vines (*Erwinia vitivora*) which had been temporarily discontinued, was recently resumed. The long-term experiment on the susceptibility of varieties at Constantia had to be laid out anew. When lifting the old experimental vines, it was established that although the aerial parts (six years after planting) did not reveal any symptoms of infestation, the Jacques rootstocks on which the vines were grafted, were heavily infested. The bacterial blight organism was isolated from the soil and also from old prunings from the previous year and consequently the disease should in future be viewed in a more serious light.

Studies on Fruit and Vegetable Preservation.

The expansion of the preserving industry during the past few years gave prominence to many problems demanding investigation on an extensive scale. This work was seriously hampered by lack of staff as well as by continual changes in the staff. During the past three years the Institute lost no less than 7 officers, who were absorbed mainly by the food technicological industry at a stage when they had just gained useful experience and were beginning to render most profitable service. Investigation was nevertheless carried on and both growers and the industry could be given valuable advice.

Guavas.—More than 4,000 vitamin C determinations were made on new guava crosses and selections and, in addition, determinations were made of moisture and of ratios of rind to pips and to flesh. Chemical investigations of carbohydrate in this fruit were continued and the data indicate the absence of Sorbitol.

Plums.—A detailed study was made of the chemical composition of and pectin changes in Satsuma, Methley and Santa Rosa varieties, particularly with a view to determining whether the gel properties of the latter two varieties could be so improved that jam factories could utilize the fruit on a more extensive scale. Further, the suitability of varieties such as Billington, Gaviota, October Purple, Wilson, Eclipse, Venus and Navrabeen for canning and the making of jam was investigated and also the suitability of prune varieties for preservation in various forms.

Pears.—In continuance of the project with pears, in connection with the influence of climate, variety, stage of picking, storage and ripening temperatures and gas treatments on quality and keeping property, the effect of the same factors on the canning life and quality was studied. For this purpose about 4,000 tins of pears were canned; the investigations are being continued.

Other Fruits, etc.—The suitability of strawberries and fig varieties was tested for various forms of preservation. In addition to a series of determinations on the quality and value of certain imported dehydrated products, an investigation necessitating about 400 chemical determinations was carried out to determine the nutritional value of various kinds of dried fruit according to grade.

Vegetables.—The work on the methods of preparation, pre-treatments and suitability of vegetable varieties for various preservation processes was continued. Special attention was given to the following: sweet potato (24 varieties), carrots (17 varieties), peas (6 varieties) and sweet corn (27 varieties). In the survey of the mineral and vitamin A and C contents of vegetables carried out in the Knysna area, the low potash content was particularly striking.

Experiment Farms.

The experiment farms were maintained and developed to the extent permitted by the available funds.

At *Bien Donne* considerable lengths of irrigation furrow were completed and the irrigation system was generally improved. The development of the 80 morgen of the high-lying ground which will now also be placed under irrigation, was continued. Experimental plantings were extended and preparations made for an expansion of the nurseries. The extensions to the meteorological observatory were completed and additional houses built for labourers.

At the Paarl Experiment Station, the main improvement consisted in the removal of granite blocks from ground which will be utilized for a trellising experiment.

Dehydration and Cold Storage of Food Products.

G. M. Dreosti, M.Sc. Ph.D., Officer in Charge, Dehydration and Cold Storage Laboratory.

THE functions of the laboratory are to conduct industrial investigations and to render direct scientific and technical assistance along practicle lines to the food industries generally. All food processes are included in the scope of the work, particularly dehydration, canning, the extraction of fruit juices and concentrates, and refrigeration. The work covers food products such as vegetables, fruit cereals, meat, fish, oils and fats, eggs, dairy products and even such products as chicory, tobacco, etc.

During the war years, the laboratory developed a vegetable dehydration industry in the Union and not only evolved almost all of the equipment and processes used in the factories, but also controlled the industry in all its aspects, including the allocation of official contracts. Direct and detailed assistance was given to the factories, and also to the Rhodesian Government, in the establishment of their plants and techniques.

All raw materials, operations at the factories, and final products were closely inspected in order to ensure that only the best products were delivered to the Admiralty to whom most of the products were supplied. The dehydrated products and packaging were of a very high standard.

The functions of the laboratory also include the technical control of cold stores, and consequently regular inspections are undertaken in terms of the Livestock and Meat Industries Act, (No. 48 of 1934) From time to time the meat and egg stocks of the Director of Food Supplies and Distribution have been inspected in accordance with the usual practice during the war, and technical assistance has been rendered in regard to the stacking and optimum conditions of storage of these commodities, and also in regard to the routine testing of egg fillers and the supervision of the cleaning and fumigation of the cold stores.

The laboratory also has a representative on the local Price Control Committee and on the National Supplies Control Committee.

The work of the laboratory was conducted under great difficulties, not only as a result of the lack of adequate special equipment, which still remains extremely difficult to secure, but also owing to the continual changes of temporary staff due to resignations. During the year there were no fewer than 23 resignations.

Unfortunately, the whole of the original staff of relatively senior officers has now left the laboratory, and under the circumstances it is most difficult to pursue effectively even the major projects on hand.

In July 1945 the Officer-in-Charge proceeded overseas for a period of nine months and visited the United Kingdom, Germany, Canada, United States of America, Hawaii, New Zealand, Australia and Malaya in connection with the scientific, industrial and economic aspects of food dehydration, cold storage and transport, quick freezing, canning, fruit and vegetable juices, citrus concentrates, drying of chicory, grain and tobacco, forest products, and the processing of agricultural raw materials generally.

A special study was also undertaken in regard to the organization of scientific and technical research in the field of food process-

found better to omit the subsequent cold water dip. Critical comparisons of water-blanching and steam-blanching for different vegetables have been continued. The variation in packing density which is possible from blanching differences alone, may be indicated by the fact that a 20 per cent. higher density can be obtained for steam-blanching than for water-blanched carrot strips.

Better colour was retained in the dehydration of beetroot when the blanched products were allowed to cool in concentrated blanching liquid prior to draining than when drained and spread on the trays immediately after removal from the blancher.

The keeping quality of under-blanched potatoes was generally only slightly inferior to that of the best products which were blanched in sulphite solution, the only significant differences being in respect of colour. Sulphite blanching of carrots yielded products definitely superior to those blanched in water, particularly as regards colour and flavour.

During investigations with strong sucrose blanching solutions, an interference with the guaiacol-hydrogen peroxide test was discovered, with an " apparent protective " influence. Investigations are in progress to attempt to discover the mechanism of this effect, which is absent when inactivated potatoes are used and even when active crude peroxidase is blanched in strong sucrose solution. The effect was absent with glucose solutions.

An interesting discovery with glucose is the fact that by its addition to the blanching solution in small quantities the reconstitution value of the dehydrated vegetables is appreciably increased. This important discovery is being followed up, also with other solutes as the imperfect reconstitution of dehydrated vegetables generally is considered to be one of the main defects of these products.

Sealing of Tins.—Investigations are in progress in regard to the sealing of tins with press-in lids. A special crimper has been designed whereby these lids can readily be made to close almost airtight. The principles underlying the method are being fully investigated, particularly with a view to the possibility of incorporating re-closure features.

Investigations are also in progress in connection with the practical application of a special sealing compound which promises to be ideal as a seam dope.

Gas-packing.—A rapid method of gas analysis, based on the absorption of oxygen by copper in ammonia, was evolved for factory use and applied in practice. The rates and times of flow of gas required, when the industrial gas-packing equipment evolved in the laboratory is used, were worked out for a number of new commodities.

Compression.—Investigations on the compression of dehydrated vegetables have been continued, both with and without the use of certain binders, particular attention being given to green beans, onions, cauliflower, cabbage, carrots, beetroot and potatoes. For instance, after blanching in a glucose solution it was possible to compress all the vegetables tested, except potatoes, into firm blocks without any need for the usual moistening of the product and re-drying of the block after compression, with the attendant losses of SO_2 content and Vitamin C.

Storage.—Various kinds of available non-metal moisture-proof containers were investigated for the storage and transport of dehydrated vegetables, but none was found to be adequately vapour tight.

Factory managers were therefore advised that in the event of their desiring to use non-metal packages, these should be packed into hermetically sealed 4-gallon squares for wholesale distribution, with an advice to the retailer, pasted over the lid, that only as many packages should be removed as could be sold within one week or less, and with an advice on the packet to the consumer that the contents should be used within one month of purchase.

Mashed Vegetables.—As the potato is extensively consumed in the mashed state, it is considered that dehydrated potato mash and potato mash powder will probably find a much greater demand than strips or even slices. Laboratory investigations have shown that a satisfactory and economic procedure for existing dehydration factories, is to cook the peeled potatoes fully in a 0·1 per cent. sodium sulphite solution, mash with the addition of 1 per cent. salt, subdivide by forcing through orifices, e.g. by means of a roller-sieve device, load to ¾ in. density, and dehydrate.

Dehydration in the trolley-tunnel drier occurs rapidly; e.g. within 2 hours the moisture content is under 5·5 per cent. The resultant product reconstitutes very readily into a good mash—in fact better than any overseas mashed potato powders tested—by the addition of hot water, allowing to stand for 5 minutes, and mashing. The use of dehydrated mashed potato should prove an excellent way of incorporating potato in dehydrated soup mixtures, and experiments are also in progress in connection with the making of other mashed dehydrated vegetables in the form of strings and tablets.

Potato-mash Powder.—A great future is anticipated for this commodity in the United Kingdom and the United States of America, and it may find a fair demand in South Africa. Special equipment and techniques, some of which are patented, are required for producing this product. A special plant for the application of the Cambridge spray method is being manufactured and will probably be in operation in the Union early in 1947. This will be the first plant of its type in existence.

The laboratory is endeavouring to evolve an alternative, simpler and cheaper method for which as much as possible of the existing plant at factories in the Union can be utilized. The result of the preliminary investigations seem promising.

Puffed Potatoes.—The immersion of dehydrated potatoes, which have been blanched in relatively strong brine, in hot oil for a few seconds, results in their becoming puffed to form a light, crisp and tasty snack. The factories have been advised and assisted in applying the technique evolved in the laboratory, and the product has recently been placed on the South African market. The required dip ranges from 4 seconds to 15 seconds in oil at temperatures varying between 270° F. and 210° F. respectively. The oil absorption is only half of that which occurs when fresh potatoes are fried in oil.

Investigations are in progress in regard to (*a*) the further reduction of oil requirements in view of its scarcity, (*b*) the factors governing the degree and manner of puffing (e.g. dehydrated potatoes do not puff well if freshly dehydrated), (*c*) the reason for the increase of oxygen and carbon dioxide in the air of the containers, and (*d*) the retardation of the development of off-flavour during long period storage, etc. Other methods of puffing, e.g. by means of hot air blast, and by radiation, seem promising. Investigations are also in progress in connection with the puffing of different vegetables and fruits, for the production of snacks and breakfast foods.

Soup Mixtures.—The possibility of incorporating vegetable waste materials such as beetroot and carrot tops and the outer leaves of cauliflower and cabbage in soup mixtures, particularly for use by the low income groups, is being fully explored. The total cost of the soup mixtures could, by this means, be reduced to 1s. 3d. per lb. of soup mixture.

Investigations are in progress to accelerate the drying of vegetables for soup mixtures, and the reconstitution of the final products. Now that the necessary materials are becoming available, work has been commenced on the inclusion of meat products and flavourings in soup mixtures.

Drying of Peas at Upington.—Investigations were conducted, in collaboration with the Division of Horticulture, on the atmospheric drying of green peas to evolve a suitable method for application by farmers.

Green peas could be dried in the shade to a moisture content varying between 7 per cent. and 9 per cent., the drying time ranging between 50 hours and 100 hours. The best products and highest Vitamin C contents of all blanched products were obtained by the serial blanching of shelled peas in a 0·25 per cent. sodium sulphite solution. These are comparable in quality to green peas dehydrated to this moisture content within 8 hours, but storage investigations showed that the dehydrated articles retained their quality, particularly flavour, better than the sun-dried peas. The investigations are to be repeated and continued in the coming season, in an endeavour to improve the sun-dried products, and work is also to be commenced on the shade-drying of other vegetables.

Salt.—By means of the laboratory dehydrators it was possible to work out the drying times for wet salt from the mines under different conditions of initial moisture content, loading density, and air temperature, etc. Naturally wet mine-salt chunks proved much more difficult to dry than remoistened table salt.

Other products for which suitable preparation and drying conditions have been investigated, are: beetroot and carrot tops, the outer leaves of cabbage and cauliflower, sweet potatoes, tomatoes, green mealies, sauerkraut, kaffir watermelon for soup mixtures; peach halves, bananas, pineapples, citrus and guava slices for confectionery purposes; gooseberries, strawberries (which made very good jam), and blackberries and loganberries (both of which remained tough on reconstitution); sole fillets (which formed a relatively poor dehydrated article) and liver (which was unattractive).

Pectin.—Work is being continued on the development of a simple and cheap method, for application at dehydration factories, of extracting a pectin product from citrus peels. The method adopted and developed for pectin strength determinations is the accurate measurement of sag in jellies prepared under closely controlled conditions, which gives reliable and reproducible values.

Rhodesia.—Our technical advice and plans were followed in the erection of the Rhodesian dehydration factories and in the preparation, dehydration, packaging and inspection of the products. Close co-operation was continued, and technical assistance was rendered wherever possible.

During the year two officers of this laboratory accepted posts in Rhodesia, one having become the Dehydration Officer of the Colony.

Cold Storage.

During the year 8 plans were scrutinized for the construction of new cold stores or for additions to existing stores, and 40 existing cold stores were inspected in technical detail. Most of the cold stores complied with the regulations, but a few were found to be in a poor state and suggestions for improvement were made.

Eggs.—A considerable number of flats and fillers were tested by means of a method evolved in the laboratory for their suitability for the long-period storage of eggs. The problem of mould growth on egg boxes during cold storage was fully investigated and precautionary suggestions were issued for sterilizing the boxes with a suitable fungicide during the coming egg season.

The cleaning and fumigation of a number of egg stores was supervised on behalf of the Director of Food Supplies and Distribution.

A small-scale industrial trial was made in connection with the oiling of eggs for commercial cold storage. After long-period storage the oiled eggs were superior to the controls as regards yolk index, thick white and, particularly, air space, which was much smaller for the oil-dipped eggs than for the controls. There were no notice-
and the controls.
able differences in colour, odour and flavour between the oiled eggs

Meat.—The frozen meat stocks of the Government were inspected from time to time and reports issued to the Director of Food Supplies and Distribution in regard to freezing rates, storage temperatures and fluctuations, stacking, desiccation and condition of the meat. Generally the conditions of storage specified by the laboratory were maintained, but in several cases the position was considered to be unsatisfactory.

Fish.—Investigations were conducted on behalf of a large company on the possibility of re-using washing water. Only chlorine proved really effective, but the high chlorine content excluded its re-use. Tests were also made on ice stored on fishing trawlers, which proved to be a potential source of contamination when subsequently used for keeping the fish. The contamination was largely superficial and could be greatly reduced simply by washing the ice blocks and the breaking and storage equipment immediately before use.

Preliminary investigations on the condition known as "milky fish" suggested that contamination with a type of halophilic yeast occurred in the brine tanks prior to smoking.

Drying of Grain.

Investigations on the drying of grain were concluded in the pilot plant erected at Ficksburg. The trials have proved completely successful in every respect, and showed the absence of any effect of the drying on the baking and sprouting qualities of the products.

As a result of the investigations, a full-scale plant has been worked out for drying 1,000 bags of wheat per day, and corresponding quantities of maize, oats, etc., without removal of the materials from the bags.

The cost of the plant is estimated at about £3,000, and the drying cost, including labour, fuel, depreciation, interest, etc., works out at under 6d. per bag, on the assumption that the plant is used for only 3 months per year. It is hoped to publish a complete report on the results of the investigations in the near future.

Chicory Drying.

On the experience gained in the laboratory tests a pilot bin-type of drier for chicory was designed and constructed in co-operation with the Chicory Control Board. Investigations on the pilot plant showed that uniform drying could be obtained, and that the products were better than both local and imported roots dried by conventional methods.

Special high-grade steel knives had to be fitted to the dicing machine, as the ordinary cutting blades are blunted very rapidly by the chicory. The cost of drying worked out at 3s. 6d. per 100 lb., and consideration is now being given to a possible method of reducing these costs.

The existing pilot bin-drier is to be used in the coming season for investigations on the drying of citrus peels.

Seal-Oil Extraction.

In collaboration with the Superintendent of the Government Guano Islands, a pilot plant has been designed for installation on the S.S. "Gamtoos" for the purpose of extracting seal oil from blubber on board ship. The whole plant is now being constructed and assembled to apply the process worked out in the laboratory.

In the laboratory tests, an oil of extremely high quality was obtained by the addition of water and extracting at 40 lb. steam pressure. Complete extraction takes place within 30 minutes, thus enabling a small unit to handle a large capacity daily. The investigations are being continued with the object of further simplifying the process and reducing the water requirements.

By centrifuging, the moisture content of the oil could be reduced to a small value, particularly at elevated temperatures; for instance, by increasing the temperature from 45°C to 95°C the residual moisture content in the centrifuged oil decreased from 1·8 per cent. to 0·4 per cent. Upon settling, the moisture content of the oil was about 2 per cent. after 15 minutes, but it required 18 hours for the moisture content to drop to 0·5 per cent.

After completion of the work on oil extraction it is intended to undertake investigations on the shipboard handling and processing of seal livers, and the treatment and drying of the carcasses, which normally are dumped.

The Government Guano Islands.

T. L. Kruger, Superintendent.

Staff and Labour.

THE fixed establishment has been increased during the period under review from 37 to 69 units. The additions consist of: One post of headman, Grade II, and one post of headman, Grade III, the incumbents of which serve as engine-drivers of the motor patrol boats "Pikkewyn" and "Sea Bird", respectively, one stores assistant, Grade II, one temporary biologist and the crew of the ss. "Gamtoos" which consists of 28 units employed on a temporary basis.

The monthly average of labourers employed in the stores was 39, whilst 645 casual labourers were engaged for the collection of guano and penguin eggs and for sealing. During the off-season 96 were retained on the islands to serve as boatmen, cooks, etc. The number of coloured labourers offering themselves for this class of work is gradually decreasing with the result that more native labourers have to be engaged.

Several minor accidents to labourers occurred during the year, the most serious of which was a case of a fractured leg. One labourer died on Ichaboe Island as a result of natural causes.

Offices and Stores Accomodation.

The office accommodation has become inadequate now that a biologist has been added to the establishment. It is furthermore desirable that a room be provided at the office which could be used by the captain and officers when the vessels are in port.

The boat-building shop has been renovated by the Department of Public Works and is now in good order. The building of the new guano store at Bellville has not yet been commenced with.

Islands.

Steady progress has been made with improvements on the islands, but much remains to be done, especially in repair work to jetties. A supply of second-hand rails has now been obtained from the South African Railways and Harbours Administration, and active repair work and improvements will be undertaken during the ensuing summer months.

Protection of Sea-Birds and Seals.

A number of prosecutions were instituted against fishermen during the year for transgressions at the islands, particularly at Dassen Island. Reports are continually received from headmen to the effect that fishing boats came within the prohibited areas and that the numbers of the vessels are in some cases covered up or obliterated. The most disturbing factor is that fishermen do not hesitate to come up close to the islands to fling their nets over flocks of young birds which are caught for bait. Young Malagas are particularly easy prey to such tactics. The birds, especially sea-duikers, which are the best producers of guano, are dwindling noticeably in numbers.

Guano Season.

Considering the unfavourable conditions and the abnormal behaviour of the birds, the present season may be regarded as a fairly satisfactory one, as the quantity of guano colected and allotted is very little below the average distributed during the past ten years. The allotment for the year was fixed at 6,000 tons and no

difficulty was experienced in procuring that quantity, notwithstanding the fact that over 400 tons were lost at Bird and St. Croix Islands in Algoa Bay, as a result of unexpected early heavy rains. The number of sea-duikers and the manner in which they arrived for the breeding season were most disappointing. On Dyers, Dassen and Vondeling Islands there were no duikers at all, while at the other islands which they usually frequent, they were conspicuous because of their small numbers and by reason of the fact that they arrived in small flocks up to as late as January. As a result of their late arrival for the breeding season it was impossible to commence with the collection of guano until April. Only a relatively small proportion of farmers would have recieved their guano in time for the ploughing season, had it not been that ploughing was delayed by the lack of rain. Comparatively few complaints were received from farmers concerning the late allotment of guano.

The following are the details of the volume of business conducted in respect of the year's guano yield:—

Number of applications: 7,222.

Areas Cultivated, in Morgen.

Wheat.	*Vegetables.*	*Onions.*	*Potatoes.*	*Total.*
456,803	45,215	14,114	61,655	577,787

Number of bags of guano allotted: 60,070.

Number of bags of guano taken up: 58,783.

Number of bags of guano issued to Government Departments: 29.

There was a considerable increase in the number of applicants and in the acreage cultivated.

The analyses for the past five years are as follows:—

	1942.	1943.	1944.	1945.	1946.
Phos. Oxide, Total	10·1	10·4	10·3	10·4	10·5
Phos. Oxide, sol. in 2 per cent. cit. acid	9·4	9·4	9·5	9·9	9·7
Phos. Oxide, sol. in water	3·1	3·2	3·1	2·7	2·7
Nitrogen	10·0	10·8	10·4	10·2	10·0
Potash	2·2	1·7	2·4	2·0	2·1

Penguin Eggs.

In view of the general shortage of foodstuffs and the fact that conditions appeared favourable, it was considered advisable to collect penguin eggs, but on account of the general rise in the costs of labour, foodstuffs, transport and packing material it was found necessary to effect sales only in boxes of two dozen eggs, at 10s. per box. The results proved satisfactory viz.:—

No. of boxes collected and sold.	Revenue Derived.	Expenditure.
5,625	£2,812 10s.	£2,500 approx.

Sealing.

Sealing was undertaken during the winter and the summer seasons. During the winter season 7,023 pup skins were taken, of

which 3,970 were found suitable for export. The remainder were disposed of locally as leather skins.

The season was not as successful as the previous one, for the reason that, owing to the unfortunate grounding of the ss. "Otavi", the expedition sent to the northern seal preserves was somewhat delayed and the weather was not very suitable for sealing operations during the remaining portion of the sealing season.

During the summer season 8,597 wig skins were taken, which were all disposed of locally as leather skins.

Summary in respect of Seal and Shark Products.

Number Taken.	Skins.	
	Colonial Preserves.	Northern Preserves.
Pups	3,611	3,412
Adults	3,780	4,817
TOTAL	7,391	8,229

Skins Exported.

Year.	Number Sent.	Number Disposed of.	
1942	2,030	—	
1943	11,000	2,030	
1944	6,000	3,010	
1945	3,970	8,091	
1946	—	2,480	
			15,611
Balance on Hand at Factory			7,389
TOTAL	23,000	—	23,000

Seal Oil: 21,568 gallons oil sold	£4,344	4	0
828 gallons gurry sold	48	6	0
	£4,392	10	0
Seal Liver: 63,489 lb. sold	£2,128	10	9
Shark Liver: 6,139 lb. sold	£337	0	0

Shipping.

It has been the practice, since the Government assumed responsibility for the administration of the Guano Islands in 1905, to charter ships for the purpose of serving the islands and conveying the products to store and large sums of money were spent annually in chartering vessels. Prior to 1905 the islands were worked under contract. During the war period and subsequent thereto, considerable difficulty was experienced in obtaining suitable and sufficient vessels to serve the islands. In addition, the freight charges increased approximately 100 per cent.

The ss. " Otavi ", was the only vessel specially equipped to serve the northern islands and was chartered for many years, but unfortunately stranded on 14th July, 1945. Although the owners of this vessel took immediate steps to replace the lost vessel and promised to have a suitable ship available in time for the next guano season which normally commences during February, they gave notification on 12th November, 1945, that they had been unable to procure a suitable vessel at a reasonable figure and that they were in fact no longer interested in the guano trade. This decision of the Company placed the Department in a most difficult position and there was no alternative for the Department but to acquire a ship of its own and the opportunity fortunately presented itself on the arrival in port of the ss. " Gamtoos " on 11th January, 1946. The ship was used as a salvaging vessel during the war period, and, since she was of the correct tonnage for the island work and had the necessary fresh water tankage and accommodation for labourers, it was decided to acquire the vessel from the S.A. Navy. This was done on 15th February, 1946, but as she had to be converted from a salvaging vessel into a transport and be manned and equipped, she was not able to proceed to sea until 10 April, 1946. This meant that the allotment of guano was delayed for a period of approximately six weeks.

M/V " Pikkewyn ".—Although a contract was entered into with Messrs. Louw & Halvorsen for the building of this carge motor boat of 80 tons during February, 1945, and although the keel was laid down shortly afterwards, the vessel was completed and taken over only on 11 June, 1946. The long delay in completing the vessel was due entirely to the shipping difficulties experienced after the cessation of hostilities, as no shipping space could be found for the machinery which had to be imported from England.

This vessel will have her base at Penguin Island and will be used for the purpose of patrolling and serving the northern group of islands.

" Sea Bird ".—As a result of a broken crankshaft, this boat was laid up from 28 May, 1945, until 25 March, 1946, the long delay being due to the fact that no shipping space could be found for the crankshaft which had to be imported from England.

This boat is now stationed in Saldanha Bay and will patrol and serve the colonial islands.

Factory Ship.—While the collection and the sale of guano have hitherto been the most important functions of this Organization, with sealing only a secondary consideration, the prospects are that the products which are derivable from seals might be developed into an industry as important as the guano industry. With a view to developing such products, steps are being taken te equip the ss. ,' Gamtoos " as a factory-ship and experiments will be carried out aboard the vessel during the ensuing sealing season.

Guano Prospects.

Although it is still too early to predict the prospects for the following guano season, the reports from the various islands are fairly favourable, and, unless something untowards happens, a fairly successful season may be expected.

Departmental Publications.

D. J. Seymore, B.A., Editor.

DURING the war years an unprecedanted demand for Departmental literature was experienced, as is evidenced by the fact that, whereas in the pre-war period the annual income from the sale of bulletins averaged about £200, the sales rapidly increased from 1940 onwards. The annual figures steadily rose to £1,200, subsequently to £1,400, and for the present report year the record figure of £1,694 has been reached—this despite the fact that some of the best sellers such as "Foods and Cookery", "Handbook for Farmers", etc., were out of stock, most of the available bulletins being of the 3d. and 6d. class. This large increase can partly be attributed to the return of our soldiers to civilian life, and the general eagerness to embark on some farming enterprise or other.

During the year 10,481 inquiries were received for literature, as compared with 9,651 during the previous year. As a result of these inquiries some 44,740 bulletins were supplied to applicants, and of this total about 8,900 were issued gratis. In the previous year a total of 31,180 bulletins was supplied, thus giving an increase of 13,559 for the present year. The sale of agricultural literature realized the record sum of £1,694, of which £308 represents subscriptions to "Farming in South Africa" collected for the Government Printer. During the year a sum of £165 was returned to applicants as the special publications applied for where no longer in stock.

Bulletin Series.

The Department continues to publish its series of bulletins. During the war period the printing of scientific papers was suspended, and only some of the most popular bulletins were printed.

The series of scientific bulletins has now reached the total of 265, and during the present report year 19 new manuscripts were submitted for publication, while 3 science bulletins were published and added to the series. The popular series has reached a total of 272, and during the year 11 manuscripts were approved for publication, while 11 were printed and added to the series.

Apart from these two series, the Department also publishes from time to time a series of reports and other important papers as unnumbered bulletins, and for this series 10 manuscripts were received, and 4 published during the year.

Press Service.

Apart from this regular source of agricultural information, the Department has a regular Press Service for the newspapers and agricultural journals in the Union. During the year, 26 Press Service bulletins (issued fortnightly at present) containing a total of 103 short articles on agriculture were supplied to the Press for publication.

Furthermore, 26 urgent press statements were sent telegraphically to the Press, while two other special statements were posted to the Press for publication.

Radio and Publicity Series.

Since 1928 the Department has been making use of the radio as an additional medium for bringing agricultural advice to farmers.

Originally a weekly service was instituted, but, in 1939, this service was extended to a daily broadcast for which object a special organizer was appointed. In 1942, however, the Food Controller took over the radio service for propaganda for greater food production. The radio talks in this connection were printed in the form of a publicity series and issued gratis to the public. This publicity series continued up till 1944, when Food Control became a separate institution, and the Department then issued the Agricultural production series, as well as Information to Housewives. In this way some 24,000 leaflets were supplied to the public weekly. The Agricultural production series had, however, to be discontinued in 1946, owing to a change in the form and nature of the agricultural broadcasting service.

Farming in South Africa.

During the war this monthly journal of the Department had to publish many items of information which would otherwise have been issued in the form of bulletins. Much of this information was of a very technical nature, but its publication in "Farming in South Africa" was the only feasible means of making known the results of research work for practical application by farmers.

The number of subscribers on 31st August 1946, was 9,272, the respective numbers for the English and the Afrikaans editions being 5,229 and 4,043. Altogether 156,400 copies of Farming in South Africa were distributed, 84,500 in English and 71,900 in Afrikaans. The cost of printing amounted to £6,353, of which £3,284 was for the English and £3,069 for the Afrikaans. The revenue from subscriptions and advertisements amounted to £2,537.

Handbook for Farmers.

There is still a demand for the Handbook for Farmers, but this book cannot be republished as yet. Economic conditions in the field of agriculture are still too unstable for definite advice to be prescribed in a such book which will have to serve as a guide for many years to come.

The Meat Scheme.

H. P. Smit, Director of Meat Supplies.

THE progress made with the meat scheme in 1945 was maintained during 1946 and the administration of this measure has improved in every respect.

In respect of supplies, in these times of scarcity still one of the focal points of any marketing system, the position improved considerably during 1946 in comparison with the previous year. During the first nine months of 1946, for instance, 657,527 cattle units were received at the nine controlled centres, as against 598,571 during the corresponding nine months of 1945, as will be seen from the following table:—

Slaughterings.—Nine Controlled Areas.

	Cattle.	Sheep.	Pigs.	Calves.	Cattle Units.
1945— January/September	455,147	1,325,015	250,593	59,655	598,571
1946............	528,408	1,274,391	195,837	59,920	657,527

What is especially encouraging is the fact that the slaughterings during the months of scarcity of 1946 up to the present date (22 November 1946) have been maintained at a much higher level than during the months of scarcity of 1945. The following are the comparative figures:—

Slaughterings in Nine Controlled Areas.

Week ending.	Cattle Units.	Week Ending.	Cattle Units.
6/10/1945...........	14,164	5/10/1946...........	19,932
13/10/1945...........	14,731	12/10/1946...........	16,254
20/10/1945...........	14,575	19/10/1946...........	18,734
27/10/1945...........	13,736	26/10/1946...........	18,299
3/11/1945...........	13,577	2/11/1946...........	19,306
10/11/1945...........	13,662	9/11/1946...........	16,722
17/11/1945...........	13,076	16/11/1946...........	16,697

This improvement in the supplies position is entirely due to the improved supply of cattle. In point of fact, the supply of cattle increased to such an extent that it more than neutralized the sharp decrease in the supply of sheep and pigs.

Since beef constitutes such a predominantly important part of the total annual consumption of meat and since beef marketing has such a strong seasonal tendency, it was obvious from the start that a seasonal premium would have to be incorporated in beef prices, if adequate supplies were to be drawn during the scarce season. Originally a seasonal premium of 10s. was contemplated, but owing to technical difficulties, a premium of only 5s. per 100 lb. could be applied during the 1944-45 season. This premium was, however, supplemented by a special premium during November, 1944, and the subsequent months of scarcity, bringing the total up to approximately 8s. 6d.

The full premium of 10s. was incorporated in beef prices in respect of the 1945/46 season but experience showed that it was not sufficient to draw adequate supplies during the season of scarcity and consequently it was decided to grant a premium of 15s. during the 1946-47 season. As has already been shown, the supply position is developing more favourably during the scarce months of 1946, than during the scarce months of 1945—as far as can be judged at the moment—and the step of increasing the seasonal premium has, therefore, proved itself to be justified. It must, however, be admitted in this connection that the climatic conditions of 1946 have thus far been far more favourable than those of 1945 and that the supply over two years has been very largely influenced by this factor.

The supply of slaughter-stock under the scheme also presents considerable difficulties in another respect, viz., in respect of the fluctuation in the supply of the various classes of slaughter-stock. Cases sometimes arise, for instance, where although all centres are well supplied with meat, a certain centre may be suffering from a shortage of mutton while another centre is well supplied, and after six to nine months the position may be reversed. The following table illustrates this fact.

Comparative Schedule of Arrivals of Cattle and Sheep at Cape Town and Port Elizabeth, Indicating the Inverse Proportions of the two Types of Stock that arrive at Different Centres Simultaneously.

Week Ending.	ARRIVALS AT			
	CAPE TOWN.		PORT ELIZABETH.	
	Cattle (Quota 1,698).	Sheep (Quota 19,833).	Cattle (Quota 423).	Sheep (Quota 5,314).
29/6/1946	3,003	2,277	170	5,883
6/7/1946	3,028	2,765	270	6,144
13/7/1946	2,549	1,784	247	6,164
20/7/1946	3,448	2,781	344	6,562
27/7/1946	3,307	3,915	266	7,062
3/8/1946	3,646	3,310	200	7,081
10/8/1946	3,189	2,270	163	4,558
17/8/1946	2,324	3,601	215	5,479
24/8/1946	3,184	4,786	232	6,122
31/8/1946	2,992	4,439	211	6,555
7/9/1946	2,611	5,661	342	5,198
14/9/1946	2,742	6,890	356	6,140
21/9/1946	2,657	5,474	329	5,898
28/9/1946	2,055	6,364	371	6,419
5/10/1946	2,577	7,459	303	6845,
12/10/1946	2,535	6,908	260	4,805
19/10/1946	2,908	10,399	489	3,720
26/10/1946	2,399	13,086	454	4,051
2/11/1946	3,158	11,685	411	2,612
9/11/1946	1,490	10,378	384	4,097
16/11/1946	2,413	12,193	408	2,587
23/11/1946	1,829	15,973	464	2,425

It will be noticed that round about June Cape Town was receiving hardly any sheep, but plenty of cattle, while proportionately more sheep than cattle were arriving at Port Elizabeth, and that a reversal of this relationship between the two centres developed over the past six months.

The means employed to bring about a proportional distribution of available supplies among the various centres is first, the variation of producers' prices between centres, thus, for instance, sheep prices are higher for Durban than for Cape Town, while cattle prices, on the other hand, are higher for the latter centre than for Durban. In the case of beef, the difference between certain centres is changed during certain fixed seasons of the year, but in the case of mutton the differences announced at the beginning of the year remain operative throughout the year. The following schedule illustrates this differentiation.

Cattle (Prime Grade) (Seasonal premium excluded).

Periods.	Witwatersrand.	Durban.	Cape Town.	Port Elizabeth.
January/March	58s.	55s.	60s.	55s.
April/June	58s.	55s.	59s.	55s.
July/December	58s.	58s.	59s.	55s.

Another means of distributing the available supplies as evenly as possible among the various centres, is the transferring of meat from one centre to another, where possible. In this respect the Food Control Organization is, however, seriously hampered by the lack of cold-storage facilities, since carcases first have to be chilled before transportation and the available space is required in the first instance for the storage of a reserve supply for months of scarcity.

To sum up, it can be said that the difficulties that have occurred under the scheme during the past two and a half years since its inception, chiefly amount to the maldistribution of cattle over the various seasons of the year and a maldistribution of available supplies among the various controlled areas. If the measure is to gain the necessary general popularity, it will, therefore, be necessary to improve on these aspects, if possible.

Although the maximum amount of meat kept in cold storage during 1946 did not exceed that of 1945 by much, the supply could be carried deeper into the season of scarcity owing to the more favourable supply position. On 16 November 1946, for instance, the cold-storage supply was still 47,235 cattle units in comparison with 18,308 on 17 November 1945.

Another phenomenon which has occurred under the scheme has been that when a certain class of slaughter-animal or slaughter-stock generally becomes scarce, the uncontrolled areas draw relatively more of the available stocks than the controlled areas, doubtless because butchers in the uncontrolled areas are not subject to restrictions in respect of the prices they can pay to producers, while fixed prices are enforced in controlled areas. This is clearly reflected in the following table from which it will be noticed that a steadily increasing percentage of sheep and pigs of which there is a long-term shortage, is being drawn by the uncontrolled areas as compared with the controlled areas.

This phenomenon gave rise among other things to the proposal that the meat scheme should also be applied in certain of the large country towns. This proposal is being considered.

The Food Control Organization made use of the seasons of plenty in both 1945 and 1946 to establish new trade quotas, based on

The proportion of slaughterings in uncontrolled areas to those in controlled areas (expressed as a percentage).

	Cattle.	Calves.	Sheep.	Pigs.
1942—				
First quarter	27	10	35	—
Second quarter	24	3	30	—
Third quarter	24	16	33	—
Fourth quarter	27	8	37	—
1943—				
First quarter	19	1	28	—
Second quarter	31	9	39	—
Third quarter	28	13	39	—
Fourth quarter	36	17	40	—
1944—				
First quarter	29	9	36	—
Second quarter	30	11	26	—
Third quarter	36	7	22	18
Fourth quarter	38	13	31	37
1945—				
First quarter	30	10	55	33
Second quarter	29	11	42	34
Third quarter	27	13	47	37
Fourth quarter	30	14	44	33
1946—				
First quarter	27	14	56	41
Second quarter	26	15	53	40
Third quarter	29	18	45	45

saturation issues of meat to the trade. As a result it became possible for the Organization to make a more equitable distribution of available supplies among meat dealers. During the past year the Organization was also in a better position to bring about, in the light of experience, a more equitable distribution of the various grades of meat among meat dealers. In discussing the issue of meat to the trade, mention must be made of the increasing complaints from meat dealers and the public lately about the quality of the available meat. The steady deterioration of the quality of cattle received in controlled areas since the commencement of the scheme is strikingly illustrated in the following table:—

Grading statistics in respect of the nine controlled areas for progressive periods from 15 May, 1944.

Grade.	15/5/44 31/12/44	15/5/44 31/3/45	1/4/45 30/9/45	1/4/45 31/12/45	1/4/45 31/3/46	1/4/45 30/6/46
Super	0·9	0·8	0·4	0·5	0·4	0·1
Prime	8·9	8·6	6·2	5·8	6·0	3·1
Grade I	32·0	30·3	26·2	24·3	23·9	19·1
Grade II	32·1	32·2	36·9	36·3	36·4	43·0
Grade III	18·8	20·5	23·3	25·8	26·2	28·2
Grade IV	4·2	4·3	3·8	4·0	3·8	3·2
Reserved	2·6	2·8	2·6	2·7	2·6	2·4
Rejected	0·5	0·5	0·6	0·7	0·7	0·9

Although it is not suggested that this is the only reason for the deterioration in the quality of beef marketed under the scheme, it

must be admitted that the drought conditions prevailing in an increasing measure since shortly after the inception of the scheme, have played an important rôle in bringing about this unfortunate state of affairs.

Offal and Skins.

As is now doubtless generally known, producers received separate settlements in respect of meat, offal and skins under the scheme. Meat prices are fixed by the Minister and announced in the *Government Gazette*. Offal prices, on the other hand, are arranged on behalf of producers with the dealers concerned by the Meat Control Organization, and all agents are expected to maintain the fixed prices and to sell the offal of their consignments to the dealers indicated by the Organization. In this way uniform prices for offal are maintained in a particular centre for a longer or shorter time.

When the scheme was originally instituted, offal prices were fixed on a carcase-weight basis at certain centres and per piece at others. Thus, for instance, the beef-offal price was 5s. per 100 lb. carcase weight in Cape Town, while in Port Elizabeth it was the sum of the values of all the organs constituting a complete offal—about 17s. 6d. Since then offal prices have been determined on a carcase-weight basis everywhere, except at Pietermaritzburg, and placed on the same level as far as possible. The Organization is, however, experiencing some difficulty in this respect because the demand for offal is smaller in the smaller centres (excluding Pietermaritzburg) than in the larger centres, with the result that a slightly lower price is fetched in the smaller centres.

Originally it was the policy to entrust the distribution of offal to those dealers who were engaged in the offal trade just before the scheme. Under the scheme the offal also had to move direct from the agents to such dealers. At some centres where there were no specializing offal dealers (or no satisfactory arrangements could be made with the existing dealers), machinery had to be instituted *de novo*, either by calling for tenders or by negotiation. At East London, for instance, there was no offal dealer because each butcher was responsible for the disposal of his own supplies, and in this case it was arranged with the butchers to form a pool in order to facilitate the distribution of offal amongst themselves. At one centre (Kimberley), after considerable difficulty with the contract system, the Organization itself took over the distribution of offal among dealers. In another (Durban) where the Organization undertook the distribution of clean offal like livers, tongues and tails, from the start, and agents sold rough offal direct to consumers or to native hawkers, as a result of which varying prices were paid out to producers—the Organization formed an offal company for the distribution of all offal.

Because, as mentioned above, a separate settlement is made in respect of meat, offal and skins, all rises in offal prices could be conveyed to producers immediately they became effective. If producers were paid an inclusive price for meat, offal and skins, any rise in offal prices would in the first place benefit the Meat Control Organization and producers would be left more or less in the dark as to the returns from those products. The advantages of this method of price determination and settlement to producers are very well illustrated by the phenomenal rise in skin prices. During 1946, for instance, skin prices rose by leaps and bounds as will be seen from the following table, and these increased prices were of immediate benefit to the producers.

A summary of the offal prices ruling and systems practised in the nine controlled areas is given in the following table:—

Type of Offal.

Centre.	Cattle.	Sheep.	Calves.	Pigs.
	Per 100	lb. warm car-	case weight.	Per piece.
Johannesburg..........	4s. 3d.	6s. 3d.	4s. 3d.	1s. 6d.
Pretoria...............	4s. 3d.	6s. 3d.	4s. 3d.	1s. 6d.
Cape Town............	4s. 3d.	6s. 3d.	4s. 3d.	1s. 6d. per 100 lb. carcase weight.
Durban................	5s. 0d. Average.	6s. 0d.	5s. 0d.	1s. 0d. per 100 lb. carcase weight.
East London..........	4s. 3d. Average.	6s. 6d.*	4s. 0d.	6d. per 100 lb. carcase weight.
Port Elizabeth.........	4s. 2d.*	7s. 0d.*	2s. 0d.* per piece	1s. 0d.–2s. 0d. * by weight.
Bloemfontein...........	4s. 3d.*	7s. 0d.*	2s. 0d. per piece.	1s. 3d. per piece.
Kimberley.............	4s. 3d.	7s. 0d.	1s. 6d. per piece.	1s. 3d. per piece.
Pietermaritzburg........	Sold out of hand at best prices.			

* Less specific deductions for condemned portions.

Skin Prices. (Witwatersrand).

	26/11/45	28/3/46	20/5/46	3/6/46	2/7/46	9/9/46
Merinos—						
Combings.............	6s. 6d.	8s. 0d.	8s. 0d.	9s. 6d.	10s. 0d.	11s. 0d.
Long Wool...........	6s. 6d.	8s. 0d.	8s. 0d.	8s. 6d.	8s. 6d.	9s. 0d.
Medium Wool.........	5s. 6d.	6s. 6d.	6s. 6d.	6s. 6d.	6s. 6d.	7s. 6d.
Short Wool............	4s. 0d.	5s. 0d.	5s. 0d.	5s. 6d.	5s. 6d.	6s. 6d.
Pelts..................	3s. 0d.	4s. 0d.	4s. 0d.	4s. 6d.	4s. 6d.	5s. 0d.
Shorn.................	3s. 0d.	4s. 0d.	4s. 0d.	4s. 6d.	4s. 6d.	5s. 0d.
Coarse Wool and Coloured—						
Long..................	3s. 0d.	4s. 0d.	4s. 0d.	4s. 0d.	4s. 0d.	4s. 6d.
Shorn.................	2s. 6d.	2s. 6d.	2s. 6d.	3s. 3d.	3s. 3d.	3s. 9d.
Afrikaners—						
Large.................	4s. 3d.	6s. 0d.	9s. 0d.	9s. 6d.	10s. 0d.	11s. 0d.
Lambs................	4s. 3d.	6s. 0d.	9s. 0d.	7s. 0d.	7s. 6d.	8s. 0d.
Goat skins.............	4s. 0d.	4s. 0d.	4s. 0d.	5s. 0d.	5s. 0d.	6s. 6d.
Angoras—						
Long..................	—	4s. 0d.	4s. 0d.	5s. 0d.	5s. 0d.	6s. 6d.
Shorn.................	—	—	—	—	—	—
Calf skins..............	3s. 0d.	3s. 0d.	3s. 0d.	4s. 6d.	4s. 6d.	5s. 0d.

An event in connection with the marketing of skins under the scheme which is deserving of mention, is the entrance into the skin trade of certain co-operative organizations and of a group of Witwatersrand agents which has considerably strengthened the competitive element in the trade in question. The co-operative organizations are, however, as yet by no means represented in all centres and still have to find their feet. They can be expected to play an important rôle in the marketing of skins under the scheme in due course and will assist in establishing producers' prices at the highest possible level.

Towards the end of 1945 it was decided to request the Meat Trade Costs Committee which had then just completed its investigation into trade margins with regard to meat, also to investigate the margins in respect of offal and skins and of agencies. Owing to the fact that two members of the committee were members of parliament who did not wish to be absent from Cape Town during an important parliamentary session, the committee could only commence its activities after the session. It is understood that the report of this committee will be ready in the near future.

The developments arising from the French Report on the South African food position and the possibilities of rationing were of great importance to the meat scheme. It will be remembered that the publication of the report was followed by the establishment of a Directorate of Food Supplies and Distribution, to succeed the old Food Control Organization, and that the meat scheme was at the same time divorced from the old Food Control Organization to form an independent organization with its own Director under the Department of Agriculture.

Simultaneously with the establishment of the Directorate of Meat Supplies, a re-distribution of functions between this Directorate and the Meat Board also took place, under which the Meat Board is held responsible for the supplying of slaughter-stock to the various markets and the Meat Directorate for the slaughtering and distribution among dealers. Where receiving and handling agents were formerly appointed by the Food Control Organization, they will in future be nominated by the Board who will also undertake all arrangements in connection with the disposal of hides and skins.

Courses of Training in Agriculture, 1947

AT THE COLLEGES OF AGRICULTURE

at Cedara, Natal; Glen, Orange Free State; Middelburg, Cape Province; Potchefstroom, Transvaal; Stellenbosch-Elsenburg, Cape Province.

I. AT ALL COLLEGES.

A Two-Year Diploma Course in General Agriculture.

Inclusive Fee: £36 per year, plus breakage deposit and sports fee.

Minimum Entrance Qualifications: Std. 8, and 16 years of age.

This course is held regularly at all Colleges. The course beginning in February 1947 is fully booked-up at all Colleges. Applications for 1948 are now being received, and those interested in the 1948/49 Course are advised to communicate without delay with the Principal of the College of their choice. Prospectuses and application forms are obtainable from the Principals of Colleges.

(*N.B.*—These courses are only open to men).

II. SHORT COURSES.

These courses will be held as shown below:—

College and Course.	*Duration.*	*Fee.*
Glen College of Agriculture.		
1. Special Grain-Grading (Students taking this course can qualify for the Grain Graders' Certificate)...	23 June to 18 July............	6 0 0
2. Judging of Friesland Cattle........	23 June to 27 June............	1 10 0
3. Poultry Farming..................	7 July to 18 July.............	3 0 0
Potchefstroom College of Agriculture.		
1. Animal and Field Husbandry and Farm Management..............	30 June to 18 July............	4 10 0
2. Poultry..........................	30 June to 4 July.............	1 10 0
3. Home Economics (Weaving)........	7 July to 11 July.............	1 10 0
4. Home Economics (Designing and Draping of Garments)...........	14 July to 18 July............	1 10 0
Stellenbosch-Elsenburg College of Agriculture.		
At Elsenburg.		
1. Dairy and Pig Farming...........	30 June to 4 July.............	1 10 0
2. Viticulture......................	30 June to 4 July.............	1 10 0
3. Poultry..........................	7 July to 11 July.............	1 10 0
4. Horticulture.....................	7 July to 11 July.............	1 10 0
At Stellenbosch.		
5. Home Economics.................	30 June to 4 July.............	0 5 0*
6. Grain Grading....................	30 June to 11 July............	0 10 0*
7. Vegetable Production............	1 to 5 December...............	0 5 0*

* Fees at Stellenbosch are for tuition only. Students must arrange their own accommodation.

N.B.—

1. Applications should be addressed to the Principal of the College concerned.
2. Accommodation at Colleges is limited and early application is recommended. The closing date for applications for short courses is 14 days before the course begins.
3. Subject to accommodation being available, women may be accepted for the short courses.
4. All fees, except for short courses at Stellenbosch, include board and lodging as well as tuition.
5. Railway concession certificates are available to all students attending courses at Colleges of Agriculture.

Crops and Markets

A Statistical and Economic Review of South African Agriculture

by

The Division of Economics and Markets

Volume 26 FEBRUARY 1947 No. 294

CONTENTS

Price Review for December 1946.*

Fruit.— Large quantities of peaches, apricots and plums reached the markets and experienced a strong demand. The demand for citrus, fruit which continued to come on the markets in smaller quantities, exceeded the supply. Moderate consignments of pineapples and papaws were disposed of favourably.

Tomatoes.— Supplies of tomatoes increased on most markets and consequently prices of ordinary tomatoes on the Johannesburg market declined from 2s. 1d. per tray in November to 1s. 11d. per tray in December, and on the Cape Town market from 3s. 4d. to 3s.

Onions.—Larger consignments of onions came on the markets and prices decreased considerably. Prices of Transvaal onions on the Johannesburg market declined from 21s. 11d. to 16s. 8d. per bag; on the Cape Town market from 26s. 11d. to 12s. 4d. per bag; and local onions on the Durban market from 24s. 8d. to 19s. 8d. per bag.

Potatoes.—Still larger quantities of potatoes reached the markets than during the previous month and prices decreased further. Smaller consignments of sweet potatoes were sold at lower prices than during the previous month.

Vegetables.—In general supplies were still very moderate and fairly high prices were realized.

Seeds, Grains and Feeds.—Lucerne hay was offered in large quantities on the Johannesburg market, but teff and oats, particularly of good quality, were scarce. Lucerne prices decreased slightly, but were nevertheless firm.

Eggs and Poultry.—The supply of eggs showed a still further decrease on most markets, and prices were high. Further increases in the maximum wholesale and retail prices of eggs were announced towards the end of December. Supplies on the poultry market were insufficient to meet the strong demand which arose towards Christmas and New Year, and good prices were realized.

* All prices mentioned are averages.

Index of Prices of Field Crops and Pastoral Products.

The above index, which appears elsewhere in this issue, decreased from 204 the previous month to 200 in December, 1946.

The most important changes occurred in the following cases:—

(*a*) "Hay" decreased from 165 to 157 in November, particularly as a result of a greater supply of lucerne hay.

(*b*) "Other Field-Crop Products", i.e. potatoes, onions, sweet-potatoes and dry beans, decreased from 309 to 236 as a result of a further price decrease in the case of potatoes.

(*c*) "Pastoral Products" decreased from 179 to 168 in December as a result of a small decrease in average wool prices.

(*d*) "Poultry and Poultry Products" increased from 171 to 200 in December due to a further increase in the prices of eggs and also of table poultry during Christmastide.

Review of the Wool Market during December 1946.

During December 1946 a total of 64,310 bales of wool was offered for sale in Union Ports, of which 47,368 bales (74%) were sold.

Good quality wool, particularly spinning and short wools, experienced a strong demand, but inferior types attracted little competition. Sales were generally less favourable towards the end of the month and the average prices were in most cases somewhat lower than those of the previous month.

Maximum Prices of Eggs.

The maximum wholesale and retail prices of eggs in controlled areas as fixed on 13 December 1946 (see "Crops and Markets" of January 1947) have been increased all round by a further 2d. per dozen for each grade as from 20 December 1946.
(See *Government Gazette Extraordinary* of 20 December 1946.)

Maximum Prices of Poultry.

The maximum wholesale and retail prices of turkeys in the Union as fixed on 23 November 1945, and those of other poultry as fixed on 11 January 1946, have been discontinued as from 3 January 1947.
(See *Government Gazette Extraordinary* of 3 January 1947.)

Production of Lucerne Hay.

During the past few years lucerne enjoyed a keen demand on account of the scarcity of other hay feeds, grain products, and protein

rich concentrates. The result was that the constant increase in demand caused prices to advance considerably, as is reflected in the following prices per 100 lb. for Cape lucerne hay on the Johannesburg market during the period 1938-39 to 1945-46.

	s.	d.
1938-39	3	10
1939-40	3	0
1940-41	4	2
1941-42	5	7
1942-43	5	5
1943-44	5	4
1944-45	6	4
1945-46	6	6

The remunerative prices realized largely encouraged the production of lucerne, even in less important centres of production. As no agricultural census was held during the war years, no actual production figures are available for the present season, but the following table reflects the tendency in lucerne hay production during the past few years. The table gives the tonnage of lucerne hay produced in the six most important lucerne hay producing areas in the Union for the 1936/37 season, according to the agricultural census, as well as the consignments by rail of lucerne hay, from the railheads in these areas for the 1944/45 and 1945/46 seasons.

Area.	Production 1936-37.	Consignments by rail 1944-45.	1945-46.
	Tons.	Tons.	Tons.
Orange River........................	16,526	88,838	101,668
Oudtshoorn..........................	31,540	16,971	38,438
Olifants River......................	12,390	33,799	32,771
Fish River..........................	25,633	16,606	4,842
Sundays River.......................	15,052	16,616	9,086
Vaalhartz...........................	12	18,008	23,908
	101,153	190,838	210,713

Although the date for consignments by rail do not strictly agree with the production figures, it is clear, however, that production in the lucerne areas progressed immensely. The 1936/37 census showed a yield of 240,367 tons for the Union as a whole, of which 101,153 tons came from the areas mentioned above, and according to this proportion the production in the Union can be assessed at near 500,000 tons.

It should also be borne in mind that the consignments could have been far greater in 1945/46 if climatic conditions had been more favourable in the Fish and Sundays River areas.

Lucerne Prices.—The maximum price for lucerne hay remains unchanged as fixed on 16 November 1945, viz. 6s. per 100 lb. for the producer, f.o.r. producer's station, as well as the maximum price at which co-operative societies may sell, viz. 6s. 3d. per 100 lb.

Traders who buy direct from producers must also sell at the same fixed maximum price, f.o.r. producer's station.

In the most important producing areas the maximum price is 6s. 3d. per 100 lb. in all cases, including the producer.

Prices of Baconers and Slaughter Cattle.

Baconers.—In order to encourage the production of baconers, of which the Union has at present a serious shortage, and also to compensate farmers for the rising costs of concentrated feeds, the producer's prices of baconer pigs have been increased under the Meat Scheme with effect as from 23 December 1946 to 1s. 3d. per lb. and 1s. 0½d. per lb. dressed weight for 1st and 2nd grade baconers, respectively. (See *Government Gazette Extraordinary* of 20 December 1946.)

The previous increase in prices of baconers was on 12 July 1946, when prices were fixed at 1s. 1d. and 10½d. per lb. dressed weight for 1st and 2nd grade baconers, respectively.

Prices of Slaughter Cattle.—The upward trend in the prices of slaughter cattle in the controlled areas, which started operating during the middle of June 1946, reached its peak on 28 October 1946, viz. 15s. per 100 lb. dressed weight, and since then prices have remained at that level.

As the general weather conditions were considered fairly favourable, it was decided, after consultation with the Meat Board, to reduce prices gradually, as from the end of December 1946, viz. as follows:—

As from 31 December 1946 by 2s. 6d. per 100 lb. dressed weight for all grades in controlled areas; from 6 January 1947 by a further 2s. 6d. per 100 lb; and thereafter by 1s. per 100 lb. per week till 17 March 1947 when the lowest peak in prices for the season will be reached.

Wholesale and retail prices of meat, of course, remain unaltered.

Maximum Prices of Potatoes.

Due to a greater supply of potatoes on the markets, the maximum prices of potatoes in the controlled areas as fixed on 22 November 1946 were again reduced as follows as from 27 December 1946:—

In the case of potatoes sold direct by a producer to a trader, the maximum prices are 26s. 0d., 25s. 0d., 21s. 6d. and 17s. 0d. per bag (150 lb.) f.o.r. for 1st grade sized, 1st grade unsized, 2nd grade and 3rd grade, respectively.

When the sales take place by auction or otherwise on behalf of the producer by an auctioneer, a market agent, broker or other agent, the maximum prices are 26s. 8d., 25s. 8d., 22s. 2d. and 17s. 8d. per bag, respectively, including commission. Railage may, however, be added to these prices.

In the case of potatoes sold on behalf of a producer by a market agent the maximum prices are 28s. 5d., 27s. 5d., 23s. 11d. and 19s. 2d. per bag, respectively, including railage, commission, transport and other market charges.

For potatoes sold direct by a producer to a consumer in quantities of 150 lb. or more at a time, the maximum prices are 29s. 6d., 29s., 25s. and 20s. 6d. per bag, respectively, f.o.r. producer's station or delivered at the buyer's premises.

The wholesale price is 29s. 9d., 29s., 25s. 2d. and 20s. 4d. per bag, while the retail price for quantities less than 150 lb. is 9d. per 3½ lb., 9d. per 3½ lb., 9d. per 4 lb. and 7½d. per 4 lb. delivered free of charge to the consumer.

The maximum price at which undergrade potatoes may be sold by any person is 7s. 6d. per bag.

The maximum price at which potatoes outside the controlled areas, other than first grade (sized or unsized) potatoes, may be sold by any person has been fixed at 9d. per 4 lb., while the maximum price at which first grade (sized or unsized) potatoes may be sold by any person is 9d. per 3½ lb. plus the transportation costs per lb. actually incurred by the seller.

For full particulars see *Government Gazette Extraordinary* of 27 December 1946, and for previous prices see "*Crops and Markets*", January 1947.

Agricultural Conditions in the Union during December, 1946.

Rainfall.—Good rains occurred in many parts of the summer-rainfall areas of the Union, particularly in the eastern parts. The rains were, however, of the thunderstorm type and unevenly distributed with the result that many areas received little or no rain. Little rain occurred in the western and northern parts of the Union.

Pastures.—The showers of rain caused pastures to improve, but soaking rains were still necessary to promote rapid growth.

Stock.—The condition of stock was generally fair, especially in parts where rain occurred, but began to deteriorate in the Karoo, while in the northern Transvaal and the Lowveld the continual drought caused stock losses. Lumpy skin disease still occurred in the western and south-western Cape Province, the Border area and the Transkei. In Natal, nagana and Red Water fever caused stock losses, while lumpy skin disease has spread still further.

Crops.—Wheat crops were generally good. The Orange Free State and eastern Cape Province harvested excellent crops. Summer cereal crops were also promising, and although hail caused damage in certain parts of the western Orange Free State and Transvaal, a good maize crop was nevertheless generally expected, provided general rains fell in the main maize areas before the middle of January. In Natal the sugar cane has shown rapid improvement after the rain, although an irrecoverable setback was suffered as a result of the earlier prolonged drought.

Index of Prices of Field Crops and Animal Products.
(Basic period 1936-37 to 1938-39 = 100.)

SEASON (1 July to 30 June).	Summer cereals. (a)	Winter cereals. (b)	Hay. (c)	Other field crops. (d)	Pastoral products. (e)	Dairy products. (f)	Slaughter stock. (g)	Poultry and poultry products. (h)	Combined index.
WEIGHTS.	19	13	2	3	34	6	17	6	100
1938–39	92	109	96	89	79	102	106	94	93
1939–40	86	114	77	95	115	105	106	89	104
1940–41	108	120	106	156	102	108	110	103	109
1941–42	120	144	143	203	102	131	135	136	124
1942–43	160	157	144	159	122	147	168	167	147
1943–44	170	186	137	212	122	154	185	188	159
1944–45	183	186	160	281	122	177	179	184	164
1945–46	201	194	164	312	118	198	185	170	170
1946—									
January	198	194	191	347	118	204	188	204	174
February	198	194	158	305	118	186	184	224	171
March	198	194	160	280	118	186	181	241	171
April	198	194	176	298	118	186	180	279	174
May	249	194	170	284	119	186	177	289	184
June	246	194	178	287	119	218	178	260	184
July	245	194	182	303	120	231	183	193	182
August	242	194	181	319	120	231	188	164	181
September	243	194	183	351	163	231	196	156	198
October	240	194	166	365	171	231	204	155	201
November	240	210	165	309	179	194	208	171	204
December	242	210	157	236	168	194	209	201	200

(a) Maize and kaffircorn.
(b) Wheat, oats and rye.
(c) Lucerne and teff hay.
(d) Potatoes, sweet potatoes, onions and dried beans.
(e) Wool, mohair, hides and skins.
(f) Butterfat, cheese milk and condensing milk.
(g) Cattle, sheep and pigs.
(h) Fowls, turkeys and eggs.

Average Prices of Eggs and Poultry on Municipal Markets.

SEASON (1 July to 30 June).	EGGS.			FOWLS (Live, each).			TURKEY COCKS (Live, each).		
	Johannesburg, New-laid. Per Dozen.	Durban, New-laid. Per Dozen.	Cape Town. Per 100.	Johannesburg.	Durban.	Cape Town.	Johannesburg.	Durban.	Cape Town.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	1 0	1 1	7 11	2 6	2 4	2 7	10 7	12 7	10 3
1939–40	0 11	1 3	7 4	2 6	2 5	2 5	10 2	12 5	9 3
1940–41	1 1	1 3	8 3	2 11	2 10	3 0	8 5	12 0	9 8
1941–42	1 6	1 9	10 7	3 5	3 4	3 7	12 10	16 2	14 4
1942–43	1 10	2 0	13 5	4 6	4 2	4 8	16 3	16 10	15 0
1943–44	2 1	2 2	14 2	5 3	5 3	5 6	16 7	20 6	15 8
1944–45	1 11	—	14 10	5 1	5 6	5 9	16 8	18 5	18 7
1945—									
January	2 3	2 2	17 10	4 5	5 2	5 6	12 8*	17 8	17 0
February	2 6	2 6	19 10	4 7	5 5	5 6	12 0	21 2	15 11
March	2 9	2 10	20 5	4 8	5 6	5 7	12 9	12 4	15 6
April	3 2	3 2	22 7	5 1	5 10	5 5	13 0	13 1	15 1
May	3 3	3 8†	26 0	5 4	4 11	5 4	13 10	14 9	15 1
June	3 2	3 5	25 11	5 11	6 1	5 11	13 0	16 7	21 1
July	1 10†	2 0	16 5	6 4	6 6	6 2	17 5	15 10	19 5
August	1 7	1 6	11 11	6 1	6 8	6 0	18 4	18 9	22 2
September	1 5	1 5	11 0	5 6	6 3	6 1	17 10	19 7	24 8
October	1 6	1 7	10 11	4 8	5 11	5 8	17 3	20 5	13 8
November	1 7	1 8	11 7	4 4	5 5	5 7	15 6	20 1	23 6
December	2 0	2 2	14 1	4 5	5 4	5 5	14 0	17 7	—
1946—									
January	2 4	2 7	18 3	4 6	5 5	5 6	14 1	14 8	—
February	2 8	2 10	20 11	4 3	5 5	5 4	12 0	15 10	—
March	3 0	3 2	21 6	4 7	5 9	5 8	12 4	14 3	—
April	3 6	3 9	27 2	5 1	5 7	5 6	12 5	12 9	—
May	3 6	3 10	28 6	5 8	5 9	5 3	13 9	18 0	—
June	2 11	3 2	26 9	6 2	5 11	5 8	15 9	15 6	—
July	1 11	2 1	16 2	6 5	6 1	6 1	17 1	17 8	—
August	1 7	1 7	12 5	6 4	5 11	6 4	19 2	18 7	—
September	1 6	1 6	11 7	5 6	5 9	6 3	18 5	16 10	—
October	1 7	1 9	12 3	4 5	5 2	6 1	17 11	17 3	—
November	1 10	2 0	14 1	4 5	5 3	6 2	15 3	14 5	—
December	2 4	2 7	17 9	4 6	5 4	5 7	15 6	20 5	—

* Prices of Turkeys: Live, each.
† Large, Grade I.

Prices of Avocados and Papaws on Municipal Markets.

Season.	Avocados (Per Tray). (a) Cape Town.	Avocados Durban.	Avocados Johannesburg. Ordinary.	Avocados Johannesburg. N.M.	Papaws. (b) Cape Town Std. Box.	Papaws Durban. Tray.	Papaws Johannesburg. Ordinary Std. Box.	Papaws Johannesburg. N.M. Std. Box.	Papaws Port Elizabeth Std. Box.	Papaws Bloemfontein Std. Box.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	1 6	0 11	1 3	1 11	2 0	0 10	1 7	2 0	2 0	1 8
1939–40	2 1	1 2	1 9	2 11	2 3	0 10	1 4	1 9	1 11	1 6
1940–41	1 10	0 10	1 5	2 4	2 1	1 1	1 9	2 2	2 3	1 9
1941–42	2 4	1 7	2 1	3 4	2 5	0 10	1 10	2 1	1 11	2 0
1942–43	3 1	1 8	2 10	4 3	3 2	1 2	2 1	2 7	2 2	2 0
1943–44	4 1	1 6	3 7	5 3	3 2	1 5	2 5	3 5	3 3	2 7
1944–45	—	—	—	—	3 4	1 6	3 1	4 1	3 5	3 0
1946—										
January	8 1	1 8	5 10	9 2	3 10	1 6	4 5	7 11	6 4	3 11
February	3 4	0 10	3 1	5 0	2 10	1 5	7 1	5 6	5 6	4 7
March	2 11	3 7	2 8	4 0	—	1 1	6 6	7 8	6 4	5 8
April	2 8	1 11	3 4	4 9	5 5	1 1	5 6	7 11	6 3	4 6
May	3 0	1 10	3 7	5 5	5 1	1 1	4 9	5 8	4 7	4 2
June	3 6	2 3	4 5	6 4	3 8	2 5	4 10	5 9	5 2	4 0
July	4 1	1 9	5 6	6 3	4 11	2 7	5 4	6 0	6 3	4 11
August	5 7	5 1	5 10	6 8	5 1	2 6	4 4	5 1	4 9	4 4
September	9 3	—	6 5	5 8	2 10	1 6	2 8	3 2	2 3	2 11
October	8 8	4 7	5 11	6 7	2 5	1 4	1 9	2 4	2 2	1 10
November	8 6	3 6	6 3	7 4	2 8	0 8	2 3	2 11	2 11	2 8
December	8 9	2 0	5 11	8 3	3 7	1 9	3 7	4 8	4 11	2 6

(a) Season 1 January to 31 December.
(b) Season 1 April to 31 March.

Prices of Bananas and Pineapples on Municipal Markets.

Season.	Bananas (Per Crate) (a) Cape Town.	Bananas Johannesburg.	Bananas Pretoria.	Pineapples. (b) Cape Town. Box.	Pineapples Durban. Doz.	Pineapples Johannesburg. Ordinary. Doz.	Pineapples Johannesburg. Queens and Giants. Doz.	Pineapples Port Elizabeth. Box.	Pineapples East London. Doz. Large.	Pineapples Bloemfontein. Bushel Box.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	22 5	9 10	16 5	5 4	3 3	1 1	—	3 5	1 2	4 10
1939–40	24 4	8 7	15 10	6 1	3 10	1 4	4 8	3 10	1 5	4 9
1940–41	27 0	7 2	14 3	5 10	2 8	1 5	2 1	4 5	1 5	5 10
1941–42	28 6	7 6	14 6	6 6	3 0	1 7	2 5	4 6	1 8	6 2
1942–43	30 0	11 9	22 7	7 4	3 0	1 8	3 10	4 11	2 1	7 3
1943–44	37 8	13 2	18 10	8 3	3 6	2 4	2 1	6 3	2 10	8 4
1944–45	—	—	—	10 4	3 9	2 6	3 9	7 3	3 3	8 6
1945—										
January	31 9	12 11	14 0	7 7	—	1 4	2 2	6 3	2 4	6 3
February	32 8	13 5	16 7	5 11	—	1 5	1 3	5 4	2 7	6 11
March	27 1	13 7	14 8	6 3	—	1 7	2 5	4 11	4 7	5 6
April	34 11	14 10	17 4	7 4	—	2 2	3 5	5 9	2 11	6 4
May	30 11	10 3	13 7	8 4	2 9	3 5	2 10	9 4	2 7	8 2
June	31 5	9 4	12 6	8 10	2 7	5 4	5 9	10 9	4 4	8 6
July	33 11	10 6	19 4	13 2	2 5	7 1	5 6	17 7	3 5	15 3
August	38 1	16 1	16 4	12 9	4 1	5 4	5 9	13 8	3 3	13 11
September	53 7	20 3	13 1	11 7	8 3	5 9	6 2	10 4	5 0	15 8
October	70 8	41 1	33 4	13 1	10 7	7 6	5 8	16 0	4 6	14 1
November	68 0	32 4	25 1	10 10	10 9	4 5	5 0	12 4	4 10	13 6
December	75 11	17 7	11 1	10 7	7 4	3 4	4 6	7 7	5 9	8 5
1946—										
January	31 9	14 4	14 11	10 4	3 0	3 5	3 4	8 7	2 9	9 3
February	54 3	12 0	13 8	8 4	2 9	2 8	4 0	8 5	4 6	9 7
March	69 7	17 3	28 6	9 10	5 9	3 0	3 8	7 1	6 7	11 6
April	75 5	29 5	17 7	11 8	5 7	4 0	5 4	9 5	2 7	9 4
May	76 8	29 8	22 2	7 6	4 6	3 4	3 6	8 3	3 10	8 7
June	77 11	23 5	26 7	10 7	5 0	4 7	4 7	7 5	6 3	12 3
July	60 11	25 4	25 8	15 7	3 2	9 3	10 3	15 5	5 7	13 5
August	72 1	23 9	31 5	19 10	4 10	7 11	9 7	16 10	4 7	13 10
September	66 5	20 6	30 8	10 1	7 7	6 5	7 2	12 2	4 7	13 11
October	78 10	28 6	34 6	15 5	6 5	6 9	6 5	13 10	4 3	14 5
November	63 8	47 10	32 4	14 10	8 11	6 3	5 4	13 10	4 6	15 11
December	67 7	30 7	35 4	16 5	4 5	7 0	—	11 11	4 7	17 8

(a) Season 1 January to 31 December.
(b) Season 1 October to 30 September.

Average Prices of Lucerne, Teff, Kaffircorn and Dry Beans.

SEASON AND MONTH (b).	LUCERNE (per 100 lb.). Johannesburg (a). Cape.	Johannesburg (a). Transvaal.	Cape Town 1st grade.	Teff Johannesburg (a) 100 lb.	KAFFIRCORN in bags (200 lb.). F.o.r. producers' stations. K1.	K2.	DRY BEANS (200 lb.) bags. Johannesburg (a). Speckled Sugar.	Cow-peas.	Kidney.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39.......	3 10	3 1	4 0	2 7	13 1	12 9	25 0	16 9	24 2
1939-40.......	3 0	2 5	3 4	2 6	8 8	9 4	21 11	13 11	21 2
1940-41.......	4 2	3 5	4 3	3 3	15 6	17 0	30 0	16 8	27 11
1941-42.......	5 7	5 2	5 8	4 7	18 10	19 6	32 10	19 8	28 3
1942-43.......	5 5	6 0	7 4	5 5	24 10	24 10	34 0	25 8	24 2
1943-44.......	5 4	5 6	7 3	4 5	21 0	21 7	49 6	29 11	32 1
1944-45.......	6 4	5 4	7 2	4 9	18 8	18 8	88 7	39 6	70 6
1946—									
January.......	7 6	—	8 1	5 9	20 6	20 6	103 4	68 6	75 4
February......	6 0	5 10	8 1	5 9	20 6	20 6	90 8	69 3	69 4
March.........	6 2	5 3	7 4	5 4	20 6	20 6	86 8	61 11	63 7
April..........	7 0	5 6	7 4	4 11	20 6	20 6	91 4	51 0	74 3
May	6 10	5 1	7 6	4 6	69 11	69 11	90 6	52 11	75 7
June..........	7 3	5 6	7 6	4 5	60 8	60 8	84 2	45 9	66 1
July..........	7 5	6 9	7 3	4 5	57 10	57 10	81 8	45 1	67 7
August........	7 5	4 8	7 3	4 3	48 5	48 5	69 11	41 1	61 7
September.....	7 6	7 0	7 3	4 4	50 0	50 0	73 0	40 4	61 11
October........	6 9	4 11	6 9	4 1	40 3	40 3	69 2	34 5	56 6
November.....	6 9	5 10	—	3 11	40 10	40 10	61 4	35 3	59 10
December......	6 3	5 6	7 3	4 5	48 8	48 8	71 1	36 6	52 11

(a) Municipal Market.
(b) Seasonal year for kaffircorn, 1 June–31 May. Dry Beans, 1 April–31 March; Lucerne and teff, 1 July–30 June.

Average Prices of Onions and Sweet Potatoes on Municipal Markets.

SEASON (1 July to 30 June).	ONIONS (120 lb.). Johannesburg. Transvaal.	Johannesburg. Cape.	Cape Town. Cape.	Pretoria. Cape.	Durban. Local.	Durban. Cape.	Sweet Potatoes. (120 lb.). Johannesburg. Table.	Durban.	Cape Town.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39.......	8 3	8 10	7 4	7 10	8 6	9 6	5 7	4 8	5 3
1939-40.......	6 3	9 10	7 3	9 11	9 8	10 5	5 7	5 9	5 0
1940-41.......	12 5	12 3	9 10	11 11	11 2	12 7	7 3	6 4	5 5
1941-42.......	10 5	13 11	10 4	13 10	13 0	14 3	9 10	7 1	8 4
1942-43.......	13 8	14 0	12 6	14 7	12 9	14 5	9 8	8 1	8 5
1943-44.......	16 2	18 9	15 1	17 4	19 1	19 2	12 0	10 9	10 7
1944-45.......	14 7	18 7	14 8	18 1	18 8	19 5	17 3	15 1	16 3
1945—									
January.......	12 9	13 1	9 11	14 8	12 3	13 5	18 2	7 8	14 7
February......	13 5	13 10	9 9	10 4	12 2	14 0	16 0	8 1	10 8
March.........	13 10	15 2	11 4	14 9	18 9	17 0	12 6	9 6	12 5
April..........	17 8	17 5	14 6	16 9	12 6	17 8	9 11	7 5	9 1
May...........	16 4	17 11	12 0	18 0	19 11	20 10	10 4	7 1	11 4
June..........	20 3	17 11	14 4	18 4	15 4	18 1	9 4	8 2	9 4
July..........	16 7	18 7	15 5	16 8	17 7	20 5	10 4	8 8	12 4
August........	18 7	18 4	15 7	18 3	16 9	19 4	11 3	8 9	12 1
September.....	16 1	17 7	16 1	19 11	19 3	20 5	15 0	12 11	14 2
October........	10 8	14 5	12 11	14 8	10 4	15 10	19 0	15 6	17 0
November.....	12 3	9 3	13 0	—	14 3	13 10	19 11	19 1	21 3
December......	14 8	15 3	15 6	17 10	16 11	15 7	17 1	14 6	17 7
1946—									
January.	12 0	12 1	9 7	—	11 7	13 0	17 1	15 6	17 3
February......	12 3	13 8	11 1	13 1	15 2	9 11	17 3	10 3	17 2
March.........	11 4	12 4	9 9	12 10	12 9	13 5	18 ·	14 8	14 8
April..........	12 1	12 10	11 3	13 10	15 1	14 9	15 2	17 4	14 7
May...........	13 6	13 9	11 9	13 9	12 10	14 7	15 8	15 6	14 5
June..........	14 7	15 5	12 2	17 1	15 11	14 11	14 11	14 8	15 1
July..........	11 10	14 3	12 0	15 0	15 2	15 6	15 2	15 2	17 4
August........	14 9	17 0	13 7	15 10	20 6	18 7	16 10	16 0	18 3
September.....	20 9	25 3	20 4	23 2	21 5	23 3	20 0	16 5	22 11
October........	24 9	28 1	32 5	24 0	32 3	31 8	24 6	16 9	20 10
November.....	21 11	—	26 11	—	24 8	21 1	23 10	15 1	20 8
December......	16 8	15 2	12 4	—	19 8	19 6	18 11	11 11	25 5

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CONTENTS

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Courses of Training in Agriculture, 1947

AT THE COLLEGES OF AGRICULTURE

at Cedara, Natal; Glen, Orange Free State; Middelburg, Cape Province; Potchefstroom, Transvaal; Stellenbosch-Elsenburg, Cape Province.

I. AT ALL COLLEGES.

A Two-Year Diploma Course in General Agriculture.

Inclusive Fee: £36 per year, plus breakage deposit and sports fee.

Minimum Entrance Qualifications: Std. 8, and 16 years of age.

This course is held regularly at all Colleges. The course beginning in February 1947 is fully booked-up at all Colleges. Applications for 1948 are now being received, and those interested in the 1948/49 Course are advised to communicate without delay with the Principal of the College of their choice. Prospectuses and application forms are obtainable from the Principals of Colleges.

(*N.B.*—These courses are only open to men).

II. SHORT COURSES.

These courses will be held as shown below :—

College and Course.	*Duration.*	*Fee.*
Glen College of Agriculture.		
1. Special Grain-Grading (Students taking this course can qualify for the Grain Graders' Certificate)...	23 June to 18 July............	6 0 0
2. Judging of Friesland Cattle........	23 June to 27 June............	1 10 0
3. Poultry Farming..................	7 July to 18 July.............	3 0 0
Potchefstroom College of Agriculture.		
1. Animal and Field Husbandry and Farm Management...............	30 June to 18 July............	4 10 0
2. Poultry...........................	30 June to 4 July.............	1 10 0
3. Home Economics (Weaving)........	7 July to 11 July.............	1 10 0
4. Home Economics (Designing and Draping of Garments)...........	14 July to 18 July............	1 10 0
Stellenbosch-Elsenburg College of Agriculture.		
At Elsenburg.		
1. Dairy and Pig Farming............	30 June to 4 July..............	1 10 0
2. Viticulture........................	30 June to 4 July..............	1 10 0
3. Poultry...........................	7 July to 11 July..............	1 10 0
4. Horticulture.......................	7 July to 11 July..............	1 10 0
At Stellenbosch.		
5. Home Economics.................	30 June to 4 July.............	0 5 0*
6. Grain Grading....................	30 June to 11 July............	0 10 0*
7. Vegetable Production.............	1 to 5 December...............	0 5 0*

* Fees at Stellenbosch are for tuition only. Students must arrange their own accommodation.

N.B.—

1. Applications should be addressed to the Principal of the College concerned.
2. Accommodation at Colleges is limited and early application is recommended. The closing date for applications for short courses is 14 days before the course begins.
3. Subject to accommodation being available, women may be accepted for the short courses.
4. All fees, except for short courses at Stellenbosch, include board and lodging as well as tuition.
5. Railway concession certificates are available to all students attending courses at Colleges of Agriculture.

FARMING IN SOUTH ... AFRICA

VOL. 22 MARCH 1947 No. 252

Editorial:

Our Soils and the Care They Deserve.

IN recent years the extensive occurence of that serious menace to our soils, viz. erosion, has received such prominence through the publicity given to it by the Department of Agriculture, the press, the cinema and leading overseas visitors, that the general public, including the urban population, has awakened to the danger threatening the country as a whole, in other words, has become strongly soil-conscious. As our most important natural asset and the source of our national prosperity, the soil deserves our most devoted care. It provides the food required by the country's population and must continue to do so if we are to remain a civilized country with any degree of self respect. Our soil is undoubtedly the foundation of national survival.

Soil consists largely of the outer disintegrated layer of the earth's crust, changed in the course of many centuries to the final product composed of broken stone, disintegrated rock and organic matter or humus. This final product, the soil, forms the soft seed-bed for plants; it is the anchorage and food store of the vegetable kingdom and the seat of change and transformation.

It teems with life and is the source of all new plant growth. The soil can therefore no longer, as in the past, be regarded as lifeless dirt.

Things grouped together under the same general heading, do not necessarily possess similar or common characteristics. This is also true of soils. The properties of sandy soils, for example, and the treatment necessary for profitable yields, differ widely from those of clayey soils.

Every tiller of the soil, whether farm owner or occupier of an erf in town, owes it to himself and his greatest asset, the soil, to learn as much as possible about soil in general and his own in particular. The extent of this knowledge will depend on the purpose for which the soil is to be used. The more intensive the cultivation, the more complete the information will have to be.

Soils intended for irrigation, for example, must be carefully inspected before the owner proceeds to incur the expense of building a reservoir and canals. The cost of inspecting the soil is negligible compared with the cost of irrigation works, which are often doomed to failure because of the presence of one or more unfavourable factors. For that reason it is the policy of the Government that no irrigation schemes shall be undertaken unless previous inspection of the soil irrigated has proved that irrigation will be justified.

In the examination of such soils, attention is paid mainly to their physical and tilling properties; the natural fertility of the soil is of minor importance since this can always be supplemented by fertilizer or improved by rotational cropping. The main object to be borne in mind, whatever the degree of original fertility, is that the needs of the crops must be met. In this way soil fertility

will be built up and maintained. Raising crops on the reserve of plant nutrients in the soil will lead to soil piracy, which cannot be tolerated or encouraged in any circumstances.

Examining the soil before launching the irrigation scheme does not preclude the possibility of failure.

Waterlogging and the attendant problem of increasing brackishness are very common difficulties, and may be caused by various factors, and consequently the reclamation of this type of soil may be very simple or very difficult and costly. In the latter case, the information gained from the original examination will be of great value in determining the cause of the difficulty and in finding a control measure.

Soils under irrigation schemes are not the only types requiring careful examination. The same attention should be paid to farms subdivided into agricultural holdings and sold as such.

In addition to a knowledge of soils suitable for irrigation or agricultural plots, the farmer should also have a knowledge of arable soils suitable for dryland cultivation and of non-arable soils. Their characteristic properties such as soil reaction, texture, structure, water-absorption capacity, drainage, erodibility and fertility, individually and collectively play an important rôle in crop production and soil destruction.

In the present circumstances farmers should do their utmost to learn more about their soil. The Government has not as yet been able to undertake a systematic survey of all the soils in the Union. The available organization deals exclusively with Government irrigation schemes and other important soil examinations. Once a detailed systematic soil survey of the Union has been made, it will be easier for the public to acquire the necessary knowledge. In a survey of this type all the necessary information relating to soils or soil types in the Union will be collected, viz. the productivity of the soils, the crops which thrive on them, topography, soluble salts, soil reaction, stony nature, the type of farming which is being or may be practised and the prevailing climatic conditions. Maps will be made available showing the physical properties of the various soil types, and supplementary reports will contain detailed descriptions of the soils as well as their possibilities. Once this has been accomplished, the agriculturist or prospective farmer will be enabled to become acquainted not only with the top-soil of his farm, but also with the subsoil and the subterranean strata as well as their requirements in respect of plant nutrients.

There will no longer be any excuse for the landowner who farms on soil with its wrong side up; in other words, with all the information at his disposal, the farmer will desist from ploughing non-arable soils on areas where climatic conditions make crop cultivation unprofitable.

It is hoped that not only *every* farmer but also *every* inhabitant of South Africa will become soil conscious. Those dealing directly with the soil should realize betimes the value of soil knowledge obtained through this type of survey. Soil should be gratefully and lovingly treated as an independent, natural living body and not as so much dirt.

Soil consciousness developed in this way, will lead to more real interest in our soil and to proper soil utilization instead of soil exploitation.

(Dr. C. R. v. d. Merwe, Division of Chemical Services.)

Cultivation and Harvesting of Groundnuts.

J. Sellschop, College of Agriculture, Potchefstroom.

GROUNDNUTS are a crop that must be well cultivated and kept free from weeds. This can be accomplished by harrowing and cultivation before the seed is planted and when the plants are still very young. If these operations are delayed, a considerable amount of hand-hoeing and weeding may have to be resorted to, and the moving of soil from the middle of the rows towards the plants is made more difficult and less effective.

Harrowing.

High, light, spike-tooth harrows, weeders or fast moving rotary hoes may be drawn across the rows from three to four days after planting until the plants commence to flower. Harrowing should, however, not be undertaken until the plants have wilted somewhat

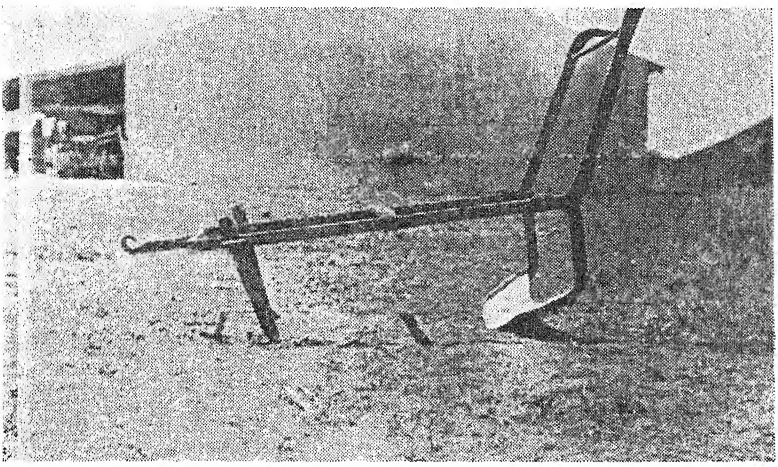

FIG. 1.—Farm-made lifter for a single row of groundnuts.

during the warmer part of the day, otherwise the more turgid ones may be readily broken. How often a crop should be harrowed, will depend on the weed growth in the rows and whether soil crusts affect the emergence of the seedlings.

Cultivation between the rows may commence as soon as the seedlings are visible. When it is no longer possible to use a set of harrows, a weeder or rotary hoe may be used very effectively. Most cultivators used for the cultivation of maize are suitable for the cultivation of groundnuts.

Ridging.

Since the nuts mature in the soil, it is often presumed that the plants should be banked, earthed or ridged up as much as is generally done in the case of potatoes. This is not necessary. It may even be harmful to either the valuable foliage or the shallow root system of the groundnut plants, particularly when the earthing-up is carried out late in the season in closely planted rows. All that is necessary is that with each cultivation a small amount of soil should be worked towards the sides of the plants. This should create a sloping hollow

between the rows for drainage and bring extra earth around the plants for the easy penetration of the developing nut stalks. The moving of soil towards the plants is of greater importance in heavy than in light soils.

Harvesting.

As the groundnut plant does not bear all its flowers at the same time, all the nuts, even on a single plant, do not mature simultaneously. Hence, while some of the oldest kernels may be fully mature and even sprout in hot moist weather, many will still be immature. It is essential, therefore, that plants in different parts of a field be examined at intervals of, say, two to three days. The crop can then be taken out of the ground as soon as it is evident that damage by sprouting or foot-rot (*Sclerotium rolfsii*) may be

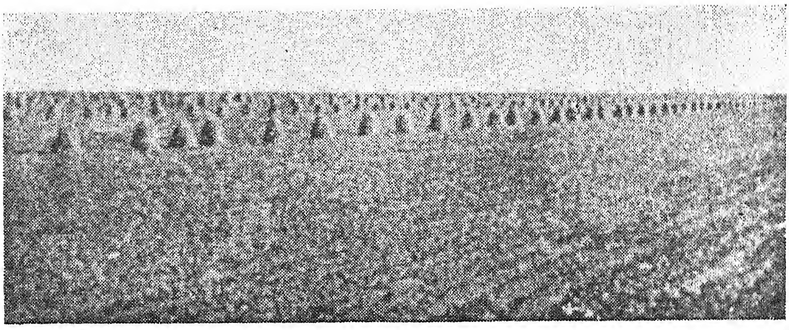

FIG. 2.—A cocked or stacked crop.

extensive if the plants are not harvested immediately. In most instances lifting may commence when the inside surface of about a quarter of the nuts has turned brown. By this time the leaves generally assume a yellowish appearance. In order that valuable hay may be saved, and to permit of easy handling of the plants, they should be lifted before they are killed by frost, or before the soil dries out to such an extent that they cannot be readily pulled or ploughed out of the heavier types of soil.

Lifting.

Small areas of groundnuts on light soils may be pulled by hand. Large areas may be ploughed out by means of a light single-furrow plough. In the case of the larger single-furrow plough it will be necessary to remove the mouldboard.

For extensive plantings special groundnut diggers or lifters will be found more useful. Until recently groundnut producers have constructed their own lifters, but several types of single and double-row lifters are now obtainable from agricultural implement manufacturers and merchants. The essential part of a lifter is a broad blade, share or cultivator tine point, run at a depth of 3 to 5 inches below the surface of the soil which cuts the greater portion of the root system of the groundnut plants and works them out of the soil. For the lifting of one row of plants at a time, an implement fashioned after a heavy single-row five-staggered-tine cultivator is used. The two rear tines are joined together by means of a broad blade, while the bottom ends of the two front tines are curved backwards to act as stabilizers and to regulate the angle and depth at which the blade cuts.

Two or more rows may be taken out at a time by means of special cutting points or blade attached to or between the heavy tines of the high-wheeled types of cultivators.

Hand or power-lift digger-lifter attachments consisting of special blades, converted cultivators or lifter-ploughs may be attached to tractors.

If carefully operated and adjusted, different types of potato diggers will also be found useful for the lifting of groundnuts, provided the stand is not too weedy, and fast draught is used.

Gathering and Stacking.

The methods to be followed in gathering and stacking the plants will depend on the size of the crop, local practice, implements and labour available, weather conditions and the quality required in the hay, unshelled nuts and kernels.

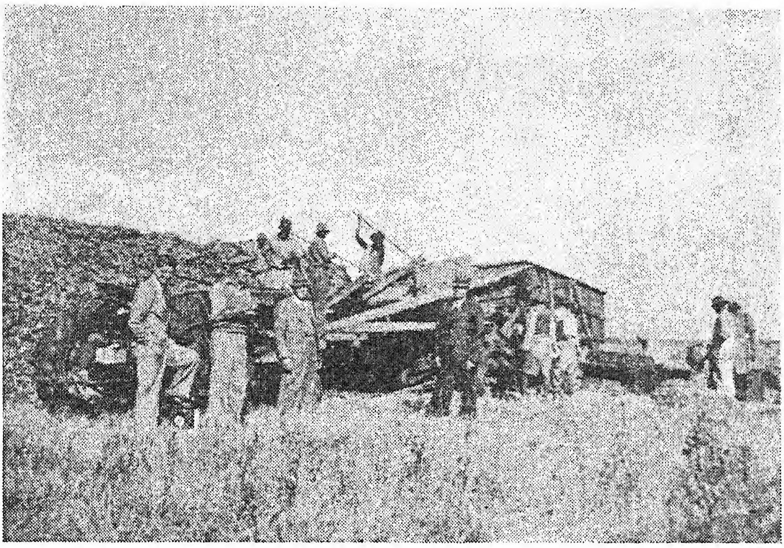

Fig. 3.—Groundnuts being threshed.

Not more than the quantity of plants that can be gathered and stacked in a day should be lifted at any time. They should be preferably be allowed to wilt for an hour or two before they are gathered and packed into small stacks. The small stacks or cocks are made more or less as follows. First, mounds of earth about four to five feet in diameter and, say, about four to six inches high, are thrown up with spades. The person packing the cock stands on the mound and packs the plants in a circle around his feet in such a way that the nuts and roots point inwards and the foliage towards the rim of the low mound. When the packed plants come to about knee-height the packer steps out of the hollow cock, and tapers off and closes it at a height of about four to five feet. A few inverted groundnut plants may be placed on the top of the cock. The method outlined merely serves as an indication of how a cock may be built. It may be varied according to the fancies of individual groundnut growers. On account of the scarcity of timber and trouble from ants, groundnuts are seldom packed around poles, as is generally the case in the United States.

Provided dew and rain have dried off before stacking takes place, groundnut plants may be stacked in a much less wilted or dried-out condition than cowpea and soybean plants. The cocks should, as far as possible, not permit rain to enter easily. In areas where foot-rot is troublesome, particular care should be taken not to stack the plants in a moist condition, allow the stacks to become wet inside, or to leave them in the field long after the nuts have cured sufficiently to be fit for picking.

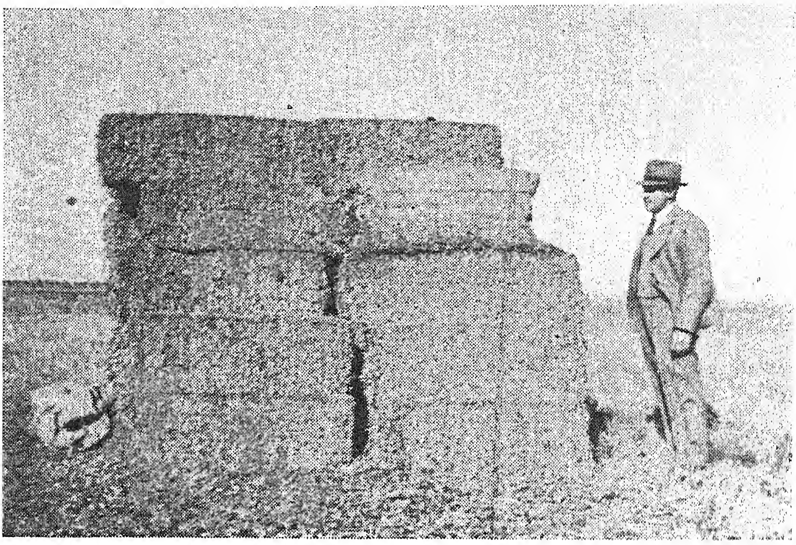

FIG. 4.—Baled groundnut hay.

The plants may also be gathered by means of ordinary hay-rakes or side-delivery rakes. They can then be left in the windrows until they are packed into small stacks. Should the windrows be fairly broad and weather conditions permit, the plants may even be left in them until they are sufficiently dry to go into large stacks or be taken to the pickers. Under these conditions, however, a considerable amount of hay is likely to be lost, while the pods may become very much discoloured and some of the kernels will split readily or be shrunken.

Picking.

The nuts are picked from the plants when they can be pulled from the peduncles, or nut stalks, without short coarse threads breaking from the pods or shells. By this time the kernels generally rattle in the pods and have a nutty flavour. Depending on the state in which the plants are stacked and the weather conditions that prevail from the time of stacking, the curing or drying in the stacks takes from two to six weeks.

The picking may be done by hand or by means of special picking machines or groundnut threshers. It is recommended that the small stacks be taken off the field for picking, thereby saving a considerable amount of good quality hay. There is then also less likelihood of fields becoming systematically infected with the groundnut foot-rot fungus that may frequently be found growing in the debris left wherever a stack has been picked. Whether the

crop is picked by hand or machine, nuts and plants of different qualities should, wherever practicable, be dealt with separately.

Sand and trash should be kept out of, or be removed from, the picked nuts, as the amount of foreign matter present in a consignment is generally determined and deducted from the total quantity

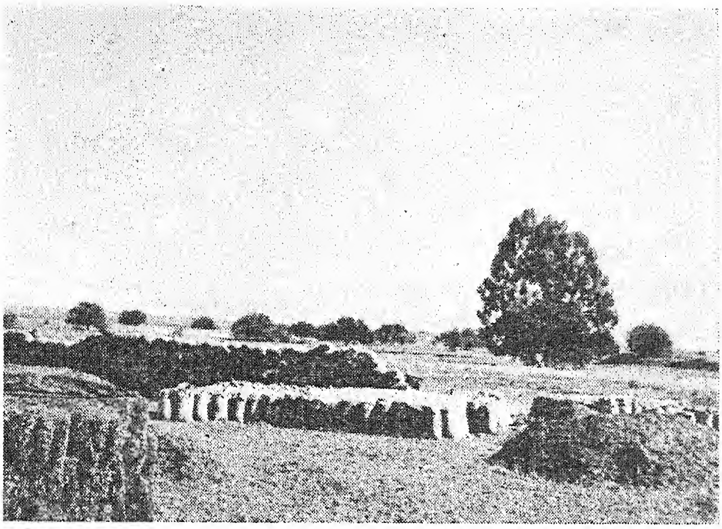

Fig. 5.—After the threshing of the groundnuts—the nuts bagged and the hay baled.

delivered for sale. Trash in particular may adversely affect the kernel content determination of the nuts when they are graded.

Pickers of different makes are imported into the Union from time to time by agricultural implement merchants.

Producers of groundnuts who are considerable distances from central shelling facilities would do well to undertake the shelling of their nuts, as the railage on unshelled nuts is considerably higher than on shelled kernels. There is also a greater demand to-day for shelled than unshelled groundnuts. Small and large shellers or decorticators are being built in the Union.

Particulars regarding the disposal of the 1946-47 groundnut crop will be announced in the press.

The Lay-out of a Piggery.

E. D. Adler, Division of Soil Conservation and Extension, Pretoria.

CLIMATIC and farming conditions in South Africa vary greatly in the different districts.

There are also various methods of pig farming: some farmers may breed pedigree pigs, while others are purely commercial porker and baconer producers. It is thus impossible to give a lay-out which will suit all conditions.

There are however, three main systems of pig production, e.g. (1) the intensive, (2) extensive or free range, and (3) semi-intensive, or a combination of (1) and (2).

The intensive system is one where the pigs are kept in a limited space and confined to the sty.

Owing to the danger of measles, the free-range system has limited possibilities in our country with its large native population.

The semi-intensive system generally suits the average farmer who desires to carry on a pig-production proposition which will fit in with the rest of his mixed-farming activities.

Whichever system is applied, the lay-out of the piggery requires careful consideration.

Choice of Site.

Choose the best site. Some people have the mistaken idea that pigs must necessarily be placed in the wettest and most low-lying locality, as for instance in a vlei. Nothing could be further from the truth. Choose a site which is well-drained, well-sheltered, cool in summer and as warm as possible in winter—the sort of place where you would not mind building your own house.

Sties should be built to face the direction from which the least cold winds come and in such a way that the greatest benefit can be obtained from the rays of the sun during winter. In most parts of South Africa a north or north-eastern aspect is desirable.

If there is a choice of soil type, it is best to choose a coarse sandy loam or even a gravelly soil. A very heavy clay soil is not desirable.

The position of the piggery in relation to the farmyard, feed and water supplies, dairy, etc., must be considered.

A piggery hidden away in a remote and at times almost inaccessible place will seldom be an asset to the farmer. The saying that " the eye of the master fattens the kine " is true also for pigs.

The lay-out should be such that working costs are kept at a minimum, and the possibility of expansion at a later date should be borne in mind.

Type of Buildings.

Elaborate buildings and expensive materials are not necessary. Use suitable material which is most plentiful and easily obtainable in your particular area. For example, thatch is often cheaper than corrugated iron for roofing. In very hot areas thatch is often preferable to iron for this purpose. Stone or split poles may sometimes be used for the walls of shelters instead of bricks or corrugated iron. Whichever system of lay-out or whatever materials are used, particular attention must be paid to the construction of the farrowing pen. The most important factor in economic pig production is the sow's regular farrowing and raising of sufficiently large litters. A sow must be absolutely comfortable during, and for a few weeks after, farrowing. If she is placed in a pen which is cramped, too cold and wet or too hot and stuffy, she will be restless and will

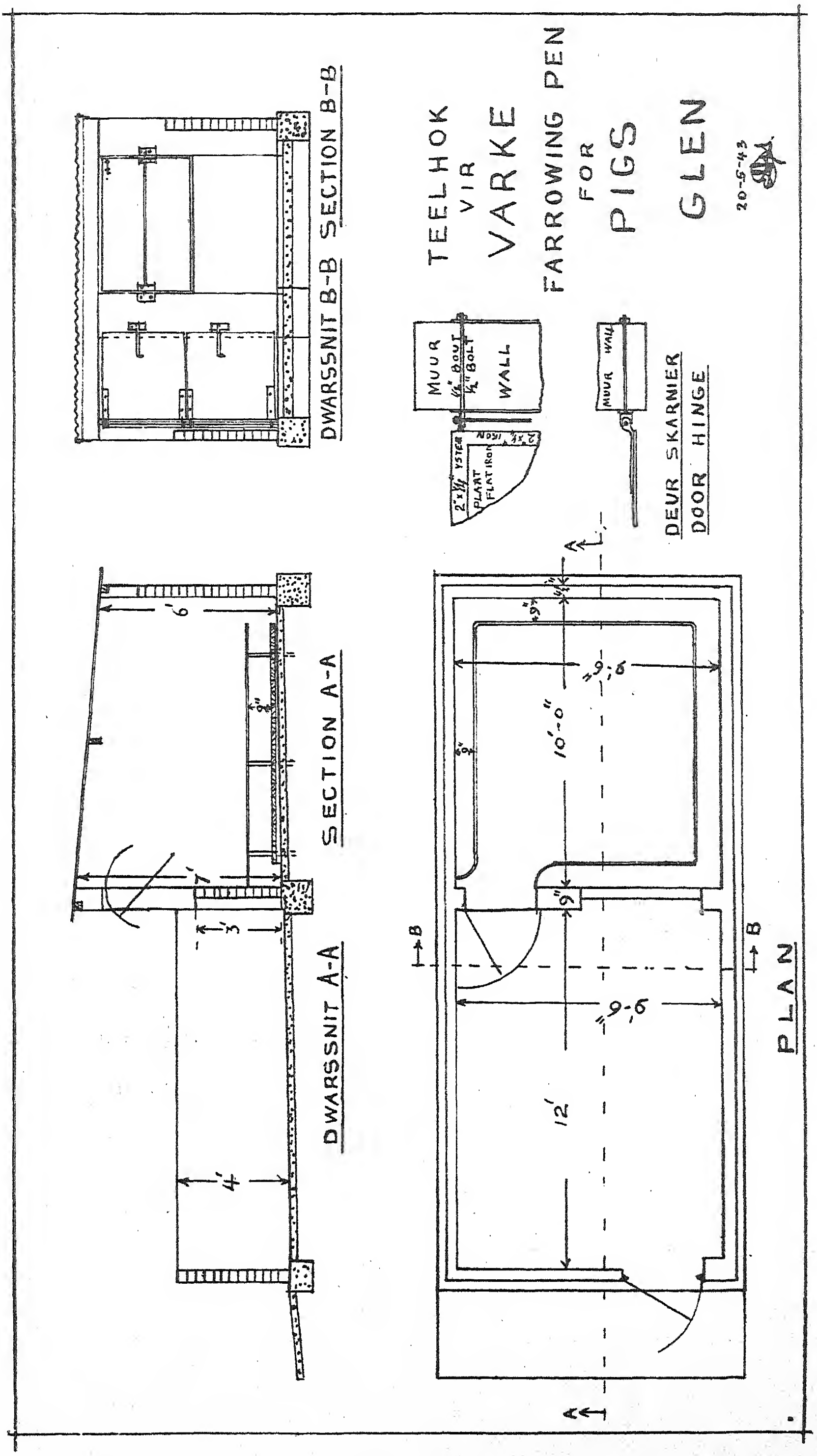

FIG. 1.—Plans of a farrowing pen.

probably lie on, and kill, most of her litter during the first three days after farrowing.

It is suggested that the farrowing pen be constructed as illustrated in fig. 1.

This type of pen can be used under any system. The floors must be made of cement-concrete and sloped to an outside drain so that washing and disinfecting can take place regularly.

Unfortunately such a concrete floor is often excessively cold. If too large a quantity of bedding is provided, the new-born piglets may be too weak to get out of the hollow made by the sow and are easily killed when the sow changes position. It is therefore recommended that in very cold areas the farrowing pen be provided with a false board floor. This board floor is made in two sections, which can be lifted and removed when the house is to be washed and cleaned. This wooden floor should occasionally be put outside to dry and treated with substances such as carbolineum and tar.

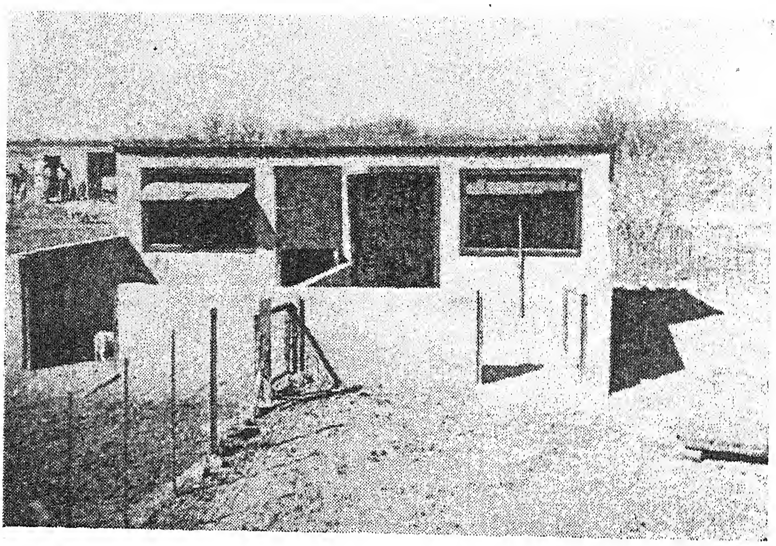

Fig. 2.—Ideal farrowing houses, showing board floors outside for cleaning.

The fact that a minimum of bedding is required with such a false board floor, is a great advantage.

The roof of the farrowing house in particular, and of all pens in general, should not be so low as to necessitate stooping and crawling to get under it in order to handle the sow and piglets, or to clean out the sty. Such low-roofed hutches are generally dark, damp, dirty, badly ventilated, and too hot in summer or too cold in winter.

In very warm areas, or where sows are allowed to farrow only during summer, the upper door and swivel window of the farrowing house, as shown in figs. 1 and 2, are not essential. On the other hand, if violent rain storms are experienced, the door and window are often very useful.

Note that the farrowing pen is supplied with a farrowing rail which must be 9 inches from the wall and 9 inches from the board floor. This rail can be made in portable sections, and need not necessarily be a fixture.

The lay-out of the piggery and types of buildings to construct will depend on the system of pig-farming.

A few examples are given:—

The Intensive System.

Fig. 3 is almost self explanatory.

The farrowing pens should be constructed as already explained and illustrated in figs 1 and 2, with the exception that a door is made in the back wall of each pen so that the pigs can have access to an exercise yard. In hot areas a wallow and a few shady trees in this yard are ideal.

The other sleeping pens do not require the swivel window or door between sleeping pen and feed yard, and can be made as large as desired.

The stud breeder who wishes to give special attention and feed to small groups of animals of different ages, sexes or breeding, will need to construct a large number of relatively small pens. The

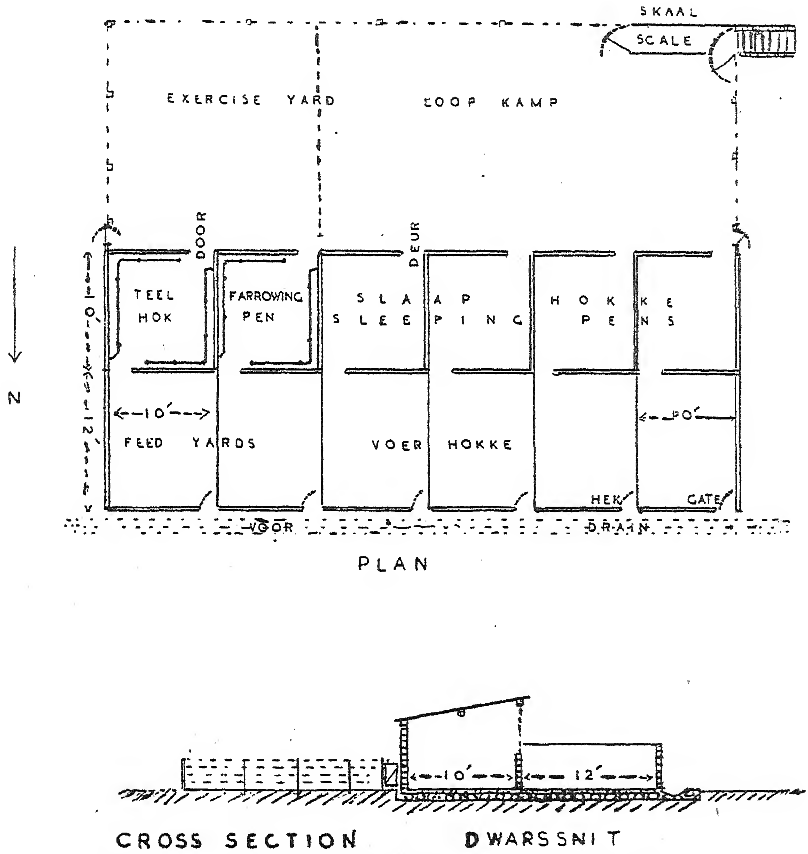

FIG. 3.—Suggested lay-out of piggery (intensive system).

commercial farmer who caters for the porker and baconer markets may find relatively larger pens more useful. It is inadvisable, however, to make these pens too large. Even where pigs are fattened on a very large scale, it is advantageous to have sufficient pens so that animals can be grouped and fed according to age, size and condition.

A pen of 10 feet by 10 feet is the most useful and can be used for farrowing or other purposes. As many as 14 dry sows or 18 baconers can be housed in such a pen, allowing 1 square feet of floor space per

sow, or 5½ square feet per baconer of approximately 200 lb. live weight.

Each pen should drain separately to a shallow outside drain. The drain should not run through a series of pens because this may cause an accumulation of insanitary material in the lower pens.

Feed troughs are not shown in figs. 1 and 3. If desired, troughs for water and food can be built-in along the walls of the feed yards. In the feed yard of the farrowing pen a special creep can be constructed so that the piglets can have free access to a self-feeder or an open feed trough, while the sow is excluded. Piglets can thus receive extra or special feed.

Such a creep consists of three guard rails, the lower one 10 inches from the floor, the middle one 8 inches higher and the top rail another 8 inches higher up.

The Semi-intensive System.

The lay-out of a typical semi-intensive pig-farming proposition is shown in fig. 5. This system is elastic and can be modified and used to suit the greatest variety of South African conditions.

Here again, a type of farrowing pen, as illustrated in figs. 1 and 2, is advised. Two such pens are built next to each other under one roof, thus saving building material. These farrowing pens are marked A in fig. 5.

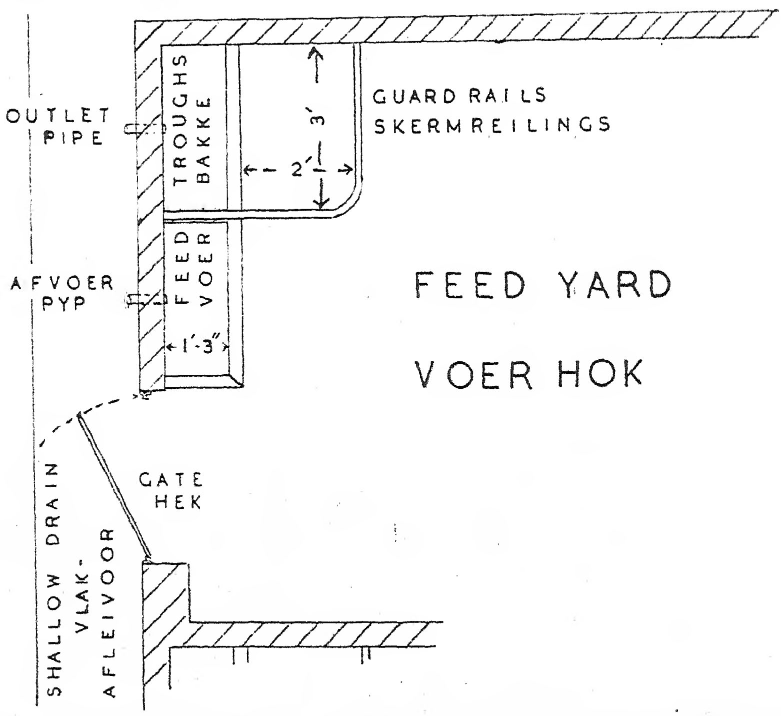

FIG. 4.—Plan of creep and built-in feed troughs in feed yard.

The shelters, marked B, can be fixed or portable. Fig. 6 illustrates a very useful type which can be constructed very cheaply where timber and thatching grass are plentiful.

Portable shelters can be made of wood, or of wood and iron. Portable houses made from wood and corrugated iron are shown in fig. 7.

The number and size of grazing paddocks can be made to suit local conditions. It is ideal to have sufficient paddocks so that they can be rested, ploughed, sown and grazed rotationally. There is a practical limit to the number of pigs that can be run in one paddock, but there is no limit, other than the cost of fencing, to the size of paddock.

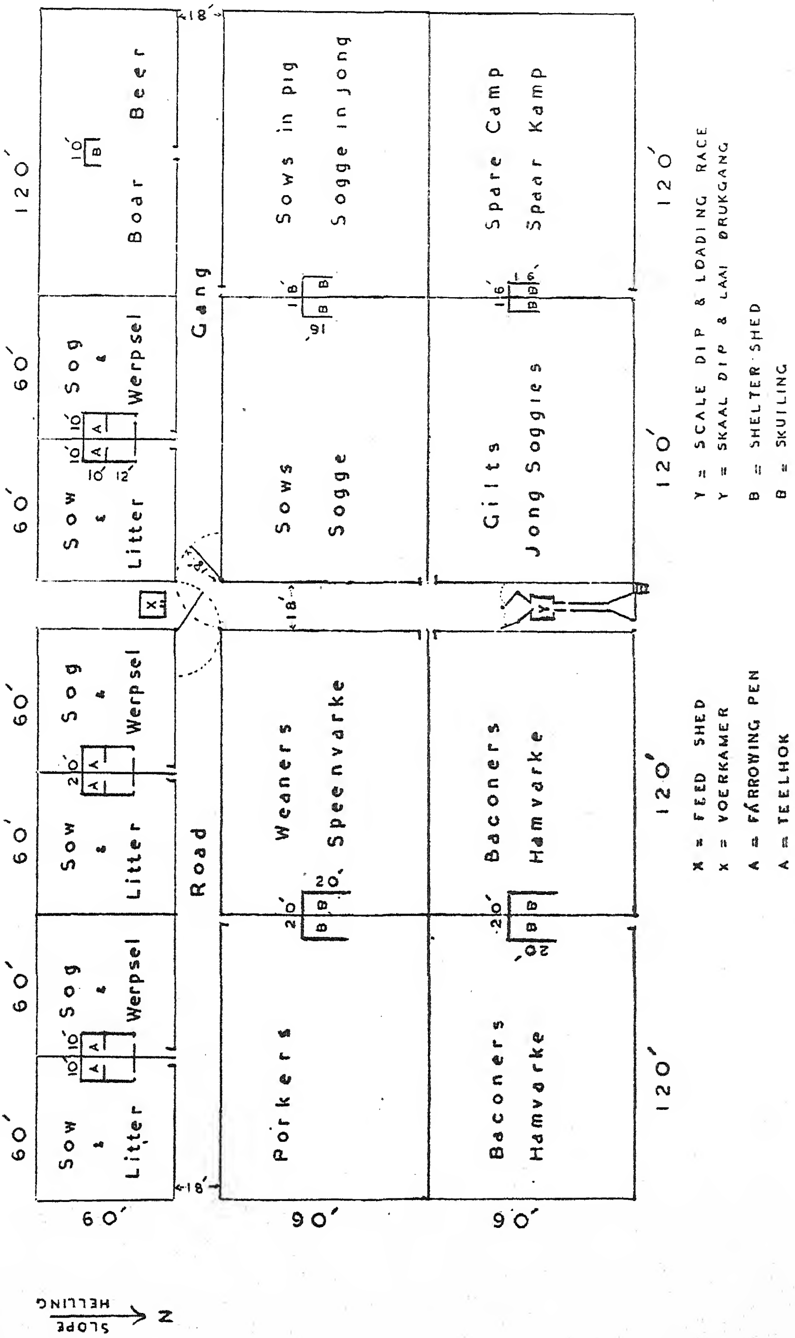

FIG. 5.—Plan of lay-out of a semi-intensive piggery.

A farm with a series of paddocks, as illustrated in fig. 5, is preferable to a similar-sized farm with a smaller number of larger paddocks.

The number of farrowing pens in relation to the size and number of other paddocks will depend mainly on the way farrowing is regulated. If all the sows are allowed to farrow in a bunch, then as many farrowing pens as sows are required. If, on the other hand,

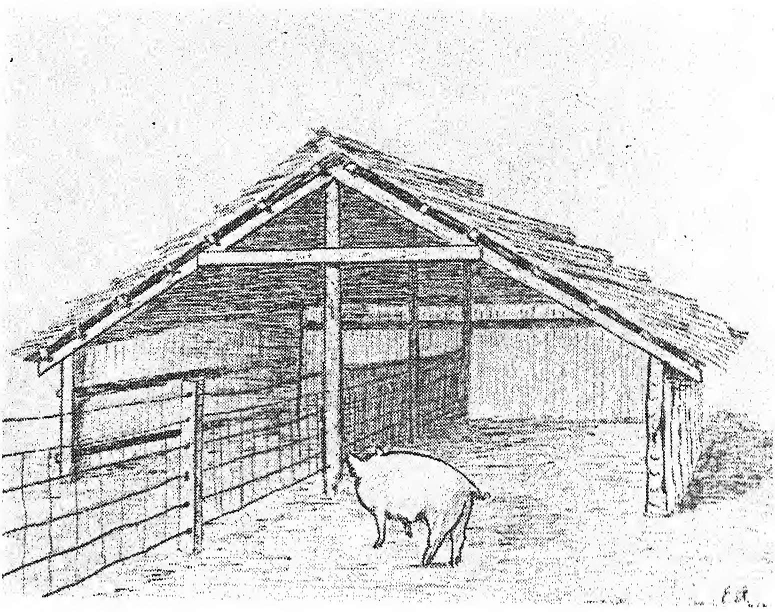

Fig. 6.—A useful type of shelter.

farrowing is arranged is such a way that sows farrow at intervals all the year round, then one farrowing pen can easily do for four sows per year.

With a lay-out such as that illustrated in fig. 5, one could keep 24 sows if farrowing is regulated properly.

If sows are to farrow all the year round, it will be advantageous to have two more spare camps so that the weaner, porker and baconer camps can be rotated.

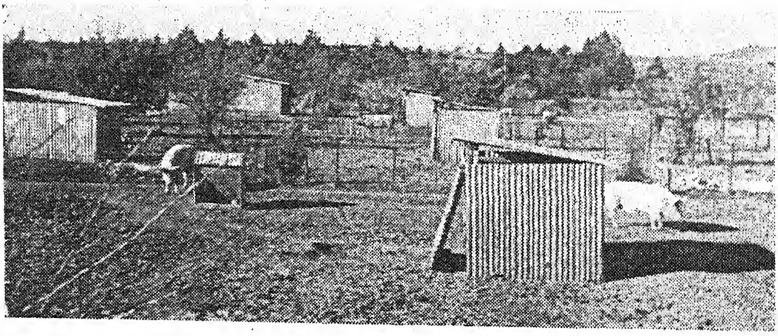

Fig. 7.—General view of a semi-intensive pig farm, with permanent brick farrowing house in the background and portable corrugated iron houses in the foreground.

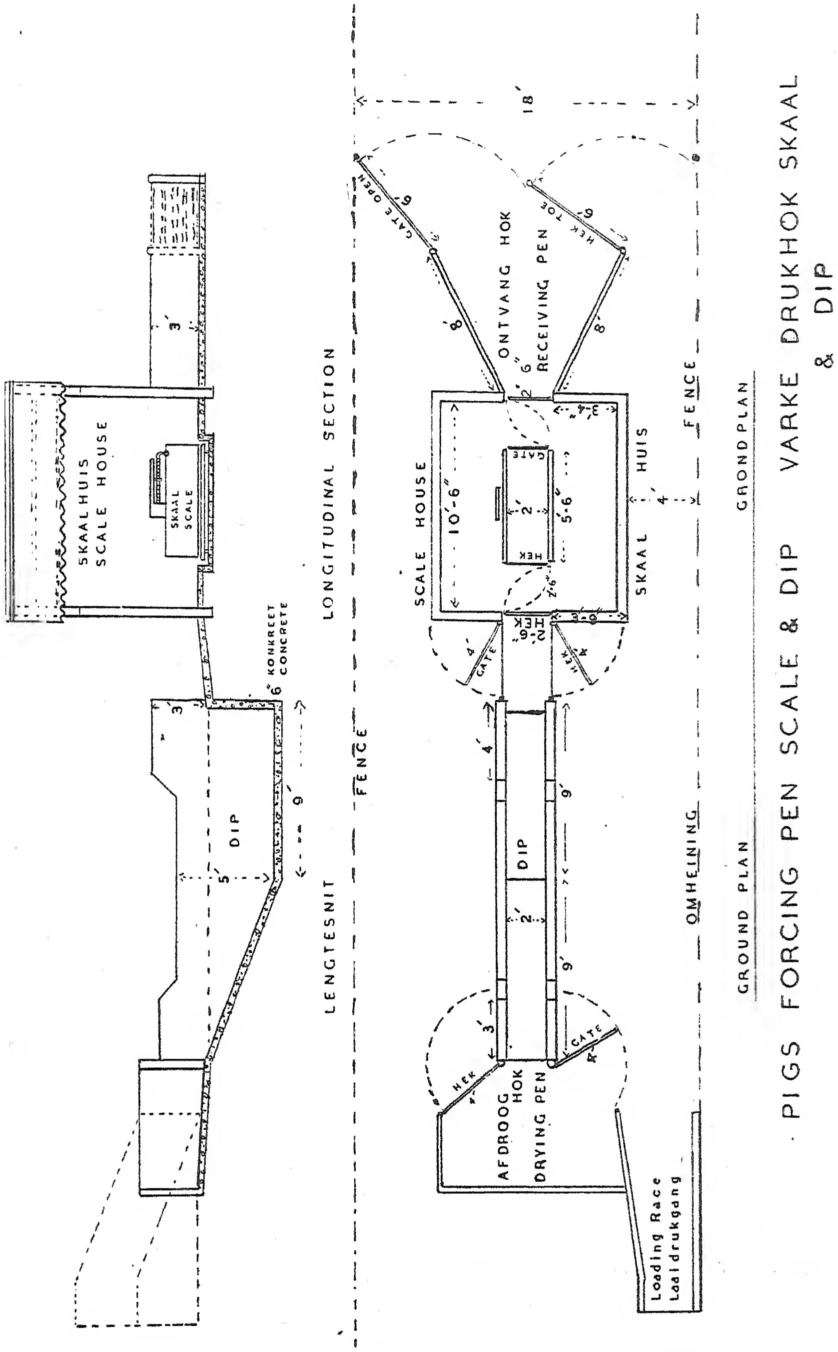

FIG. 8.—The weighing box is a strong crate open at the top, 5ft. 6 inches long, 2 ft. wide (inside measurements) and 2 ft. 6 inches high. It is made to stand on the platform on the scale. The scale is placed in a shallow pit so that the platform is level with the floor. The 2 ft. 6 inches gates of the crate swing out and the 2 ft. 6 inches doors of the scale house swing in towards the crate. Thus, when the crate gates and scale house doors are open, a gangway is formed. In Fig. 8 these gates and doors are shown closed.

Fleas are often troublesome in summer, and regular dipping must be resorted to. The 18-ft. swing gates, as illustrated in fig. 5, facilitate the handling of the pigs with a minimum of labour.

Fig. 8 shows details of a forcing pen, scale house and scale, dip and loading race.

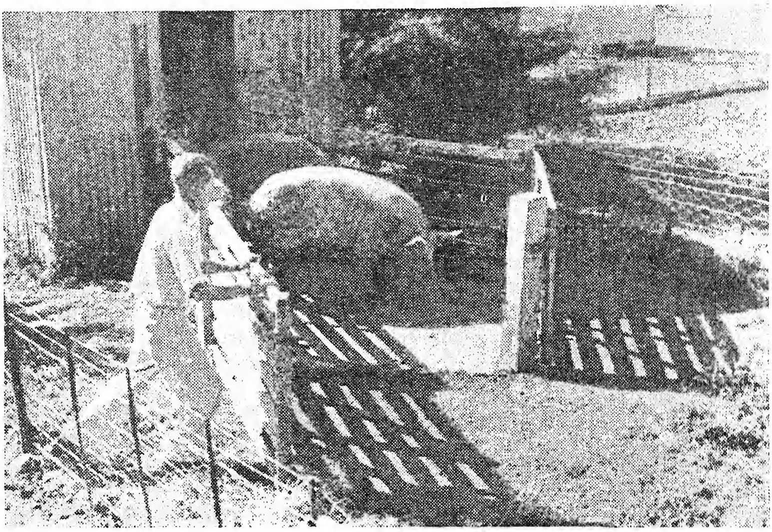

FIG. 9.—Pigs in forcing pen prior to entering the scale house.

Note that in figs. 8 and 10 there is a slope from the scale house to the water level of the dip. The fall should be at least 6 inches to prevent the splash from the dip flowing into the scale-house.

Similarly the floor of the drying pen should slope back towards the dip.

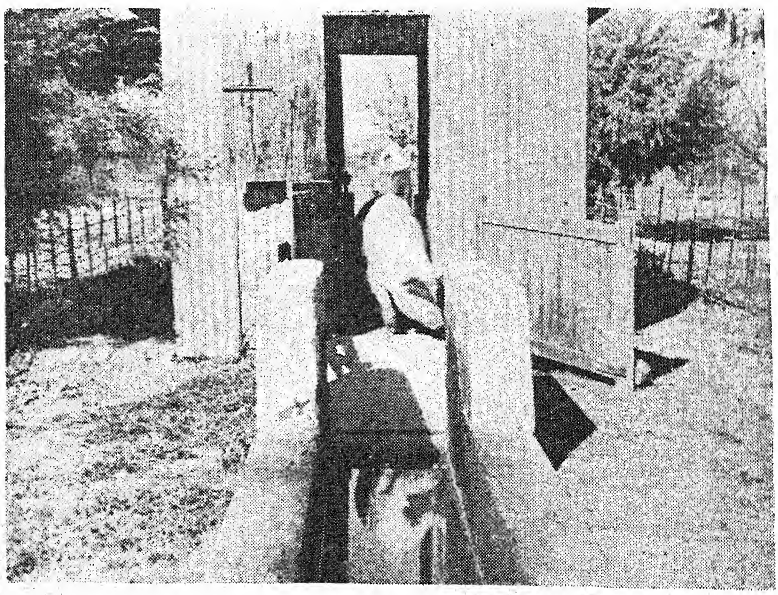

FIG. 10.—Pig emerging from scale house after being weighed.

Troughs.

Troughs can be fixed or portable. Portable feed and water troughs must be light enough to be handled by one or two labourers, but must be heavy enough and constructed in such a way that the

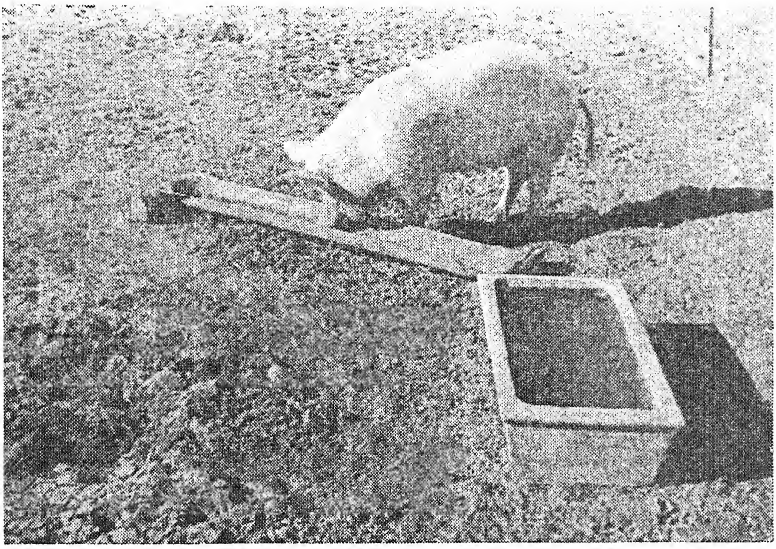

FIG. 11.—The water-trough is 18 inches wide, 9 inches deep and 3½ feet long (inside measurements).

pigs cannot upset or overturn them. In intensive houses troughs are generally built-in. Feed troughs should not be more than 6 inches deep. Water troughs should be deeper.

In fig. 11 a pig is shown feeding out of an iron railway sleeper, while a concrete water trough is shown in the foreground.

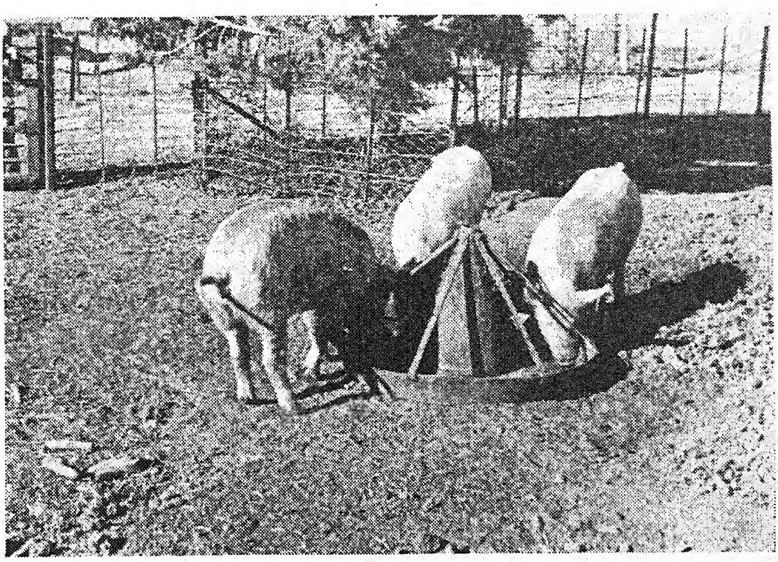

FIG. 12.—Portable circular steel feed trough.

In fig. 12 is illustrated a portable circular steel feed trough, the dimensions and construction details of which are shown in fig. 13.

Where permanent feed or water troughs are erected outside the pen and in a camp, precautions must be taken to prevent trampling out of the soil around the troughs. It is advisable to have a space of about 5 ft. around the troughs flagged with stone grouted in cement.

Troughs can be made from various materials. For example, an old motor tyre cut in two along the circumference makes two useful feed troughs. Farmers do not lack in ingenuity, and the construction of suitable troughs from available material should not offer any difficulty.

Fencing.

A well constructed fence is the cheapest in the long run. Good quality pig netting, 2 ft. wide, is generally used. Barbed wire should be spanned 6 inches above the netting and also at ground level.

To prevent pigs from rooting under the fences, heavy stones or logs can be partially buried below and on the inside of the lower strand of barbed wire. Where large stones or logs are scarce, but

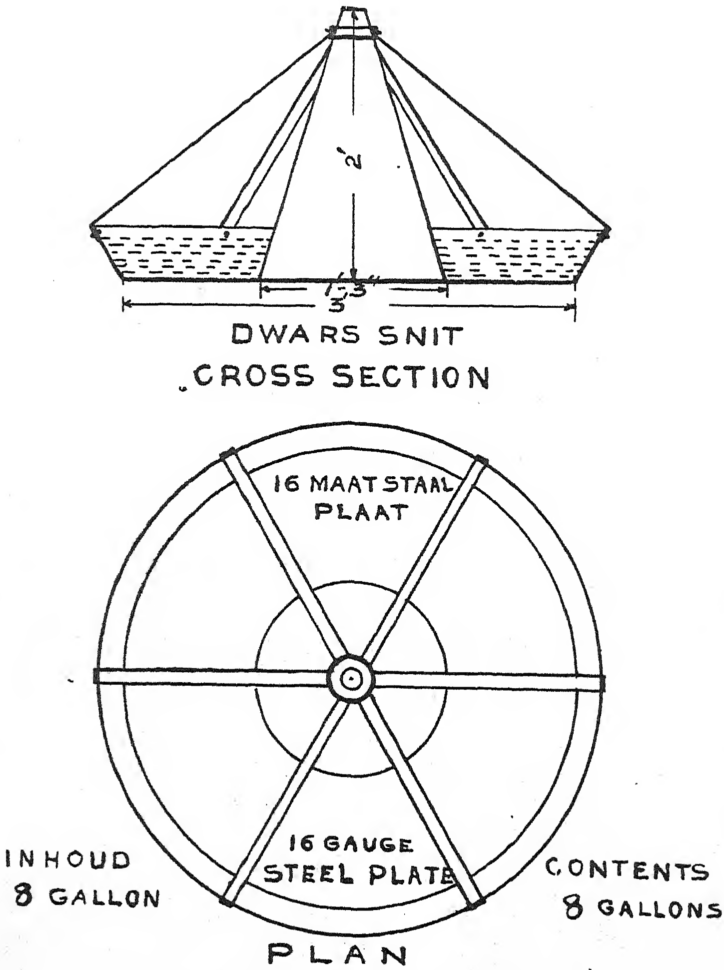

Fig. 13.—Plans of circular steel trough for pigs.

material for making concrete is relatively cheap, a good plan would be to dig a trench 6 inches deep and 6 inches wide, or a V-shaped trench 6 inches deep, and to fill the trench with concrete, reinforced with a strand of wire. The trench must be dug before the fence is erected. The concrete can be put in after the fencing posts have been placed in position. At regular intervals thick wire eyelets should be embedded in the concrete so that the concrete slab can be tied to the lower barbed-wire strand.

Shade.

In hot areas, especially under the semi-intensive system, shade during summer is essential for the well-being of the pig.

Not only do trees afford shade, but they enhance the appearance of the farm. If a few trees are to be planted in each camp it would be best to plant them next to the fences. A willow or poplar tree near the water trough serves the dual purpose of giving shade and

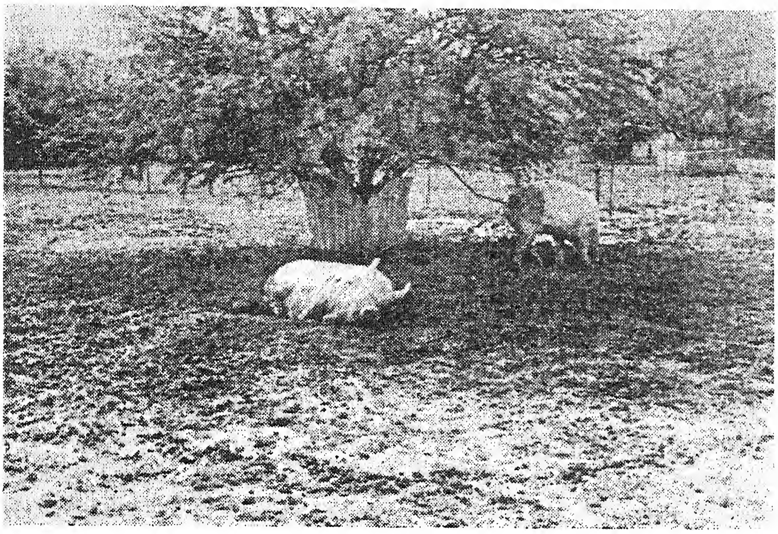

FIG. 14.—Tree protected by bits of corrugated iron.

of utilizing water when troughs are drained and cleaned.

To protect a tree, drive in three or four ordinary iron fencing standards to form a triangle or quadrangle around the tree. Just below the surface of the ground place any old iron standards, heavy iron poles or concrete slabs and tie these to the upright standards and to the pig netting and barbed wire fencing. This prevents the pigs from rooting underneath the protective fencing.

The Wallow.

Another aid to the comfort and well-being of the pig is the wallow. If properly constructed, it need not necessarily be a source of contamination and infection. On the contrary, by having a thin layer of motor oil on the surface of the water in the wallow, it can assist very effectively in the control of fleas and some other external parasites.

A wallow which has given good results at the Vaal-Hartz Experiment Station is illustrated in fig. 15.

The wallow must not be too full and the overflow must be controlled. If the wallow is constructed in a camp, as in the case of a

semi-intensive system, due care must be taken to ensure that the overflow does not collect round the wallow, because then the pigs will make their own wallows in the mud, and the whole structure may be undermined.

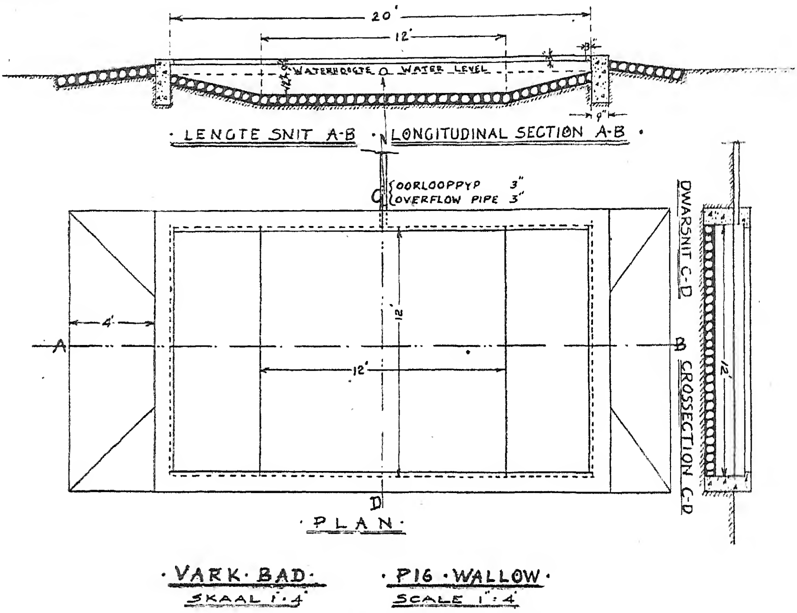

FIG. 15.—Plans of pig wallow.

Isolation or Quarantine Pen.

It is strongly recommended that a separate isolation pen be erected some distance away from the piggery. Sick animals can be treated there. On arrival, animals purchased or obtained elsewhere, must always be placed under quarantine. They should be washed, dosed for worms and left in the isolation pens until there is reasonable certainty that they are clean and free from disease. Needless to say, drainage from such a pen must be away from the rest of the piggery. An isolation pen should be constructed similarly to the farrowing pen illustrated in fig. 1.

ACKNOWLEDGMENT.

The writer wishes to express his thanks to Mr. M. J. D. Steyn, Engineer, for supplying the drawings of figures 1, 13 and 15, and to Mr. C. H. Döhse, Soil Erosion Engineer, Glen, for his advice and co-operation.

New Bulletins.

The undermentioned Bulletins have recently been published:—

Bulletin No. 260., Nutrition of Poultry, Price 6d.

Bulletin No. 264., Turkeys, Price 3d.

These Bulletins are obtainable from the Editor of Publications, Department of Agriculture, Pretoria.

The Horse on the Farm.*

V. (a) General Outline of Feeding and Management.

Dr. P. J. v. d. H. Schreuder and F. B. Wright, Senior Professional Officers (Horses).

PROBABLY our greatest shortcoming in the use and propagation of draught and other utility horses is the inadequacy of our methods of maintenance and management. The draught horse must be considered a machine that can only perform its work when supplied with the necessary " fuel ".

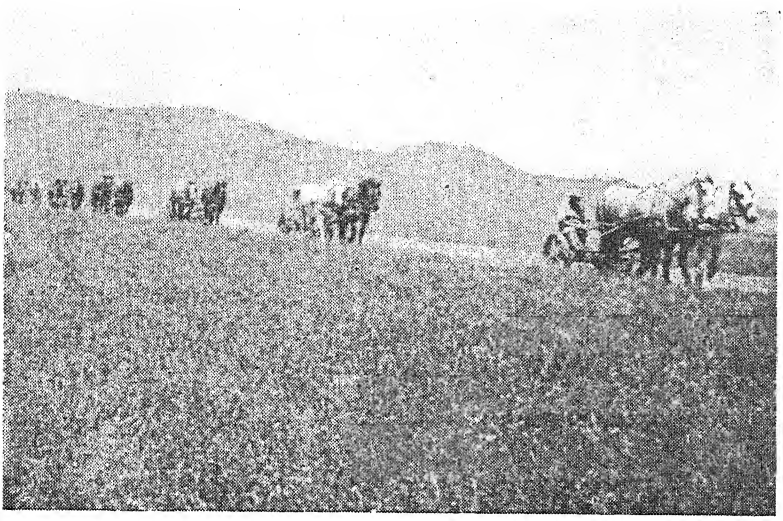

FIG. 1.—Brood mares mowing dryland lucerne.

South Africa produces a large amount of surplus grains, some of which until recently could only be disposed of profitably when bolstered by subsidies. With a better organized cropping system a larger amount of oats—horse feed par excellence—can be produced in a well-planned crop rotation system not only to the benefit of work horses, but also to the farm as a whole. Oats and maize are standard grains for horses in the greatest horse-breeding and horse-using countries. Maize is our main crop and with a steady demand for oats there should be a ready supply of this excellent horse feed, which can be grown practically wherever horses are maintained.

Well-fed and well-cared for horses and mules are economical sources of tractive power on farms and in towns. Well-balanced farming operations with a good system of crop rotation where all or a large percentage of the crops are fed to livestock, will find horse power cheapest and most efficient, for it can be employed throughout the year. Good farming methods in which attention is paid to suitable rotations, intensive farming propositions, the maintenance of soil fertility and a convenient farm lay-out, are naturally and profitably associated with good horses. In such propositions, not only are horses better fed, but the soil is better tilled and more productive.

* The first, second, third and fourth articles in this series appeared in the September, October, November and December (1946) issues of *Farming in South Africa.*

Since about 50 to 70 per cent. of the cost of horses is chargeable to feed, intelligent feeding will considerably reduce the cost. Skilful feeding not only determines the thriftiness and usefulness of horses, but also their length of useful life.

Breeding and feeding go hand in hand. If the science of breeding is to advance, the feeding of stallions, mares and young stock must keep pace with the improvement in breeding hygiene. If this is not the case, little actual improvement or progress can be realized.

The skilful user or breeder of horses feeds for long-term efficiency, i.e. he aims at feeding with cumulative effect. Meat animals such as steers, fat-lambs and baconers are fattened off during short periods, but the horse must be fed for the service he will render over a considerable period. Long-term efficiency rather than temporary economy should be the aim in the maintenance of good horses.

Important Points in Feeding.

In feeding, the following should receive careful consideration:—

Home-grown feeds.—These must meet the requirements of an adequate ration. If this is the case, they are cheapest and best.

Wholesome feeds.— Idle horses can utilize large amounts of cheap, coarse feeds, provided they are of good quality and wholesome, e.g. good veld-grass hay, teff and legume hays.

Horses are very susceptible to digestive disturbances if given unsound feeds. Heaves and even colic are caused, sometimes with fatal results. Avoid feeding dusty, mouldy, musty or otherwise damaged feeds to horses.

The ration to suit the work.—Hard working horses should be well fed, but as soon as the horses do light work or are idle, the ration must be adjusted, else there will simply be a waste of feed and often digestive disorders that may result in serious illness such as laminitis, azoturia and even founder.

Individual needs.— Horses vary more in their individual feed requirements than other farm stock—age, temperament, type of horse and kind and amount of work, as well as the season, all influencing their needs.

Variety of feeds.—An adequate ration must above all contain a sufficiency of nutrients, enough bulk for safety in digestion, and a high degree of palatability. A good mixture of concentrates and a variety of hays and fodders or grazing will readily meet the requirements of a balanced ration.

Punctuality in feeding.—All farm animals form strong habits for certain routine proceedings, and feeding time especially is anticipated with almost clock-work precision.

The obvservance of punctuality in feeding, regularity in work, and cleanliness in grooming not only promotes thriftiness and health in the horse, but ensures efficient and cheaper power.

Amounts and frequency of feeding.—Experienced observation is the best test as to a horse's satisfactory treatment and fit condition. Weight, appetite, condition of dung and spirit will give indications, if correctly interpreted.

In this connection, the following feeding rules may serve as a guide:—

(1) Idle or lightly worked horses should be fed bulkier feeds; a variety of good hays or good grazing will be sufficient to maintain a thrifty condition.

(2) With regular light work a small amount of concentrates—about ½ lb. per 100 lb. live weight—will meet requirements.

(3) Hard-worked horses will take up to 1 lb. concentrates per 100 lb. live weight and about as much of good leguminous hay—amounts that should be adjusted immediately the type of work becomes easier or the horses are idle.

Concentrate feeds are generally divided into three equal portions by weight for the day. Half of the hay ration is fed at the two meals

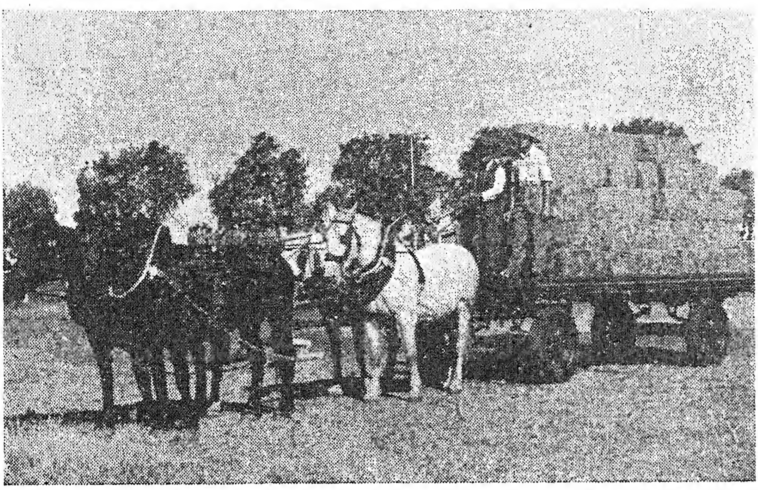

FIG. 2.—Brood mares bringing in a supply of hay feed.

during the day and the other half at night when the horse has more time to consume the bulkier hay. Often no hay or a light amount is fed at midday, since the horse works more comfortably if not unduly distended with hay.

Watering horses.—Horses should be fed and watered so regularly that they are never over-hungry or thirsty. Water them moderately before feeding and after work, and again moderately after feeding or before work; but do not permit a horse to drink his fill when very hot after hard work or before he is put to hard work. Mature horses will take from 10 to 12 gallons of water per day.

Concentrates.

Oats are the safest and best main grain feed for horses, especially stud stallions, brood mares and young stock. They contain more protein, mineral matter and fibre than maize, but are somewhat lower in energy value. Oats are probably the only grain that can be fed as the sole concentrate when no leguminous hay is available and only second-rate hays are used.

In hot weather oats are the only safe concentrate to feed if the work is hard and continuous.

Oats are preferably fed crushed or rolled to horses, and can be fed either as the sole concentrate, or mixed half and half with crushed maize, or even in a smaller percentage if a good legume hay is also fed as roughage.

Other small grains like wheat, rye and barley are also occasionally fed to horses in crushed form, but always in limited amounts and mixed with other feeds to prevent digestive disturbances.

Maize.—Only good quality maize should be used as a horse feed, since any unsound maize readily causes digestive troubles. As it is lacking in the essential amounts of protein and mineral matter, it cannot form—as is often unfortunately the case in the Union— the sole concentrate when no leguminous hay is also fed. It has, however, the highest energy value of grain feeds, and in combination with a protein-rich grain or by-product, concentrates and leguminous hays, it is in many areas the staple grain feed.

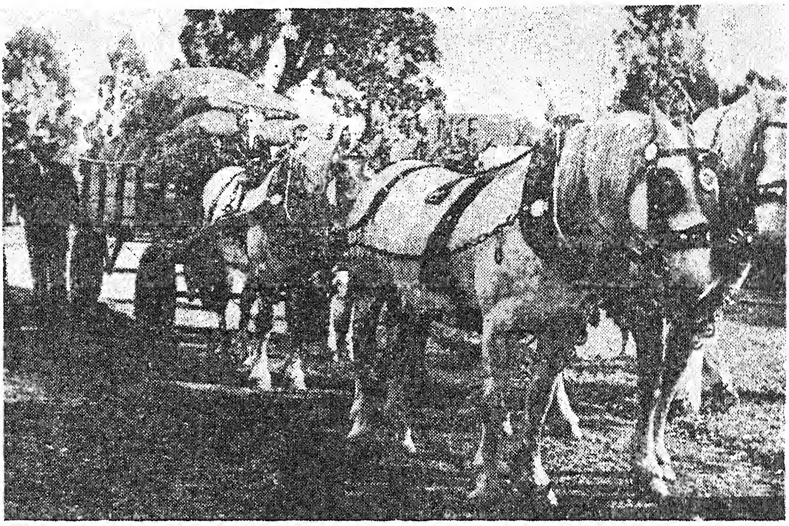

FIG. 3.—Brood mares bringing in farm feed (Cedara).

Other Feeds.

Various cereal by-products are good horse feeds.

Bran, for example, contains very desirable proteins and mineral matter, and on account of its bulk not only mixes well with other feeds, but also promotes health. Bran may form a regular portion of the ration when cost permits, or it may be given as a mash once or twice weekly, instead of the evening meal. Ten to fifteen per cent. of bran may be used with oats and maize when no legume hay is available.

A good bran mash is made of 3 to 5 lb. of dry bran, a tablespoonful of salt, and enough water to make it crumbly.

Linseed meal is, as in the case of other stock, a very good conditioner and laxative. It is a high protein feed, having about four times the value of bran and can be used when that feed is not available. About 1 lb. per day mixed with the usual concentrate ration will be sufficient, especially if the concentrates are not of high quality or sufficient variety. It promotes healthy skins and glossy coats, and is therefore necessary for conditioning horses for show purposes.

The regular use of small amounts of linseed meal ensures greater thriftiness and saves outlay on condition powders and other medicines.

Hays.—Lucerne hay is considered as most suitable for horses on account of its net energy value, total digestible nutrients, amount of crude protein and its larger yield of nutrients per morgen. For idle

horses it can be mixed half and half with other hays such as sweet-grass hay and teff. Great care must be taken, however, that such hays are wholesome in all respects. Feed only well-matured, properly cured lucerne hay, and preferably the first cutting. Freshly cured lucerne hay may often cause prussic acid poisoning. As the only roughage, it should not be fed in larger quantities than 1 lb. per 100 lb. live weight.

FIG. 4.—A load of winter feed on the way to the farm.

Best results are obtained when lucerne hay forms one third to one half of the daily hay ration and when the rest is made up of sweet-grass or other hay such as oat hay or teff.

Sheaf oats are a very common horse feed all over the Union. The ordinary early varieties of oats yield about equal amounts of straw and grain and, therefore, for short periods form a very satisfactory and adequate feed.

Bright, well-cured sheaf oats are very palatable if properly cut and cured. Cut too green or mixed with weeds, oats often produce a musty, unpalatable and unsafe feed. Fed along with a good legume hay or good pasture, sheaf oats provide a good feed for idle horses, brood mares and young stock.

Good sheaf oats form a cheap feed since threshing is saved, and are often more economical to feed if properly chaffed.

Pastures.—Good grazing is not only very healthy, but saves on the feed bill since there is no stabling or stable work. A large variety of grasses and natural veld grazing suit horses. A change of diet and grazing over different pastures reduce parasitic infestation. Treatment for parasites, internal and external, is very important. Small paddocks or camps used all the year round become filthy and often infested with internal parasites; such pastures should be rested or grazed in rotation. Fresh pastures are often too washy for horses and they should only be grazed when a fair growth has been reached.

Silage furnishes a fair feed for *idle horses* if made from mature and sound preserved maize. Mouldy silage is dangerous and even good silage is a doubtful feed for *work horses* or *brood mares*.

Carrots contain vitamins A, B, C, and E which are excellent tonics for all classes of horses, especially when stabled, for they have a beneficial effect on the digestive system, besides being fairly rich in calcium.

They should be sliced and up to 4 lb. per day fed per horse, while even a pound a day will be desirable since succulence is most essential for good health.

Preparation of Feeds.

Horses with good teeth can manage unground grain and unchaffed hays, but ground or crushed grain and chaffed hay are more palatable and more readily consumed. The cost of grinding and chaffing offsets the wastage. Oats are invariably fed crushed or rolled.

Overwintering Idle and Breeding Stock.

Undue economy and a too frugal treatment of such stock often causes more damage than any other cause.

Idle work horses often lose too much weight and are unfit for work in early summer. Young stock are stunted and brood mares get into a too low condition to nurse their foals well. Such horses should be kept in a thrifty condition—not overfat, but with ribs well covered and in vigorous health. Work horses that received good treatment during the winter can be put into shape within two weeks for the summer's hard work, while brood mares will be in fit foaling condition and young stock will not have been stunted in growth and development.

There is hardly any area in South Africa where good draught horses do not suffer a setback when not provided with additional feed or spare veld or pastures during winter. Difficult as it may be in certain areas, additional provision must be made, even if it means maintaining a smaller number of good horses, rather than let a large troop all suffer for want of proper care.

Provision must be made for at least one feed of good hay per day. Any of the luguminous hays will do, e.g. lucerne, cowpea, soya bean, with free access to straw and other roughage such as veld-grass hay, stover, etc. This additional attention to young draught horse stock is most important, for size and weight, the prime essentials in the draught horse, cannot be secured when young stock are stunted during successive winters.

Shelter.

Inexpensive shelters can be provided for weanlings and other young stock. Large open barns or stack yards or even warm paddocks, well sheltered with trees, will contribute very largely to the thriftiness, comfort and continued development of young stock. Proper stabling, of course, will give best results, and the large horse-breeder should decide whether it is more profitable to raise a dozen or more good colts properly or take his chances with a wild and stunted mob on the veld. Such animals—the products of uneconomic, unbalanced and unwise horse husbandry—often form up to 90 per cent. of the miserable and often useless stock at our large horse sales.

A good horse is the product *inter alia* of a long-term efficiency-job and not merely a temporary economic effort, as is the case with fat steers or other slaughter stock.

Working in Hot Weather.

Most of the hard work done by horses takes place during spring and summer, and it is of prime importance to keep the horses fit for spells of pressing work. Much depends on correct feeding. The bowels should be kept in a healthy condition. "Dry-dung" horses are likely to suffer from heat and digestive troubles. Succulent mash twice a week is very desirable, while a regular supply of salt, about 3 per cent. in the grain feed, is essential to offset profuse perspiration.

Frequent light watering, about every two hours or oftener, will not only relieve heat distress, but greatly refreshen the team and the labourers. A barrel of water and pail should be regular items in the field.

In extremely hot weather man and beast should be considered by resorting to the following expedients:—reducing work hours, lightening the work, lengthening the midday rest period, starting work earlier and stopping before noon. In many parts of the world and even in our large grain-growing areas farmers successfully work their horses or mules at night.

Horses that refuse their feed should not be sent to work but kept indoors or in a shaded paddock. In such cases and also in many others a reliable groom is indispensable in order to avoid overworking, and even losses, of valuable animals.

When a sick horse is put to work his sweat will "dry in" and he will pant and possibly wobble in his gait. The careful horseman will unhitch him and, if overheated, put him in a shady place and apply cold water or ice to his head, spine and legs. As a heart stimulant, camphorated oil is useful, but prevention is important, as such a horse, even though he recovers, will be more subject to over-heating when worked hard.

New Bulletins.

The following Bulletins have recently been published:—

Bulletin No. 249, Winter Pruning and Trellising of Vines, Price 3d.

Bulletin No. 259, The Engineering Problems in Soil Erosion Control, Price 6d.

Suicidal Farming versus Strip Cropping (Free).

Bulletin No. 264, Turkeys, Price 3d.

Obtainable from the Editor of Publications, Department of Agriculture, Pretoria.

Amounts of more than sixpence must be sent in the form of postal orders, cheques, etc.

Value of Dry-land Lucerne Pastures in Western Cape Province.

A. Skibbe, Stellenbosch-Elsenburg College of Agriculture.

TO prevent the depletion of soil fertility by the continuous cultivation of cereals farmers are advised to follow a crop rotation which will include a legume. Now, lucerne is undoubtedly an ideal leguminous plant, which has proved itself to be suitable for grazing under Western Province conditions, and conseqeuntly farmers are encouraged to put part of their lands under lucerne, not only because it is valuable for soil conservation, but also because it provides valuable grazing, if the rains are adequate, from autumn to early summer under dry-land conditions.

During 1934-1939 dairy cows and in 1940 ewes and their lambs were allowed to graze on a mixed lucerne pasture in an experimental test at Mariendahl, and from the data of the milk yields and of fat-lambs, suitable for slaughter, the gross returns per morgen were estimated for each season. The cost of grazing the animals was calculated from the initial and annual expenses incurred in the maintenance of the pasture. An allowance was also made for the wages of labour and for interest on the capital invested in cows. By deducting the latter expenses from the gross returns the direct approximate net profit per morgen is obtained, as no allowance is made for expenses on management or depreciation of the herd, buildings and equipment.

Description of Experimental Pasture Camps.

During the spring of 1933 lucerne was established on one of the camps at Mariendahl and was subsequently utilized for the purpose of a grazing experiment. The total area of the camp was four morgen, which in 1935 was divided into eight similar rectangular plots.

The principal flora were lucerne (*Medicago sativa*), gousblom (*Cryptostemma calendulaceum*) and turksnaels or muskus (*Erodium moschatum*). On 6 September 1934 the pasture consisted mainly of gousblom (85 per cent.), but by 1940 this weed had practically disappeared. Turksnaels, although only present in traces at the commencement, completely replaced gousblom by the end of the experimental period. The pasture in autumn, with early rains under warmer conditions, consists largely of lucerne, but by the beginning of spring about half the herbage, more or less, is composed of lucerne and weeds, in which either gousblom or turksnaels may be predominant, and as the season advances the lucerne again becomes more and more conspicuous until towards the close the weeds have wholly disappeared. These observations naturally apply to a pasture which is rotationally grazed during the season.

Milk Production and Cow-days per Morgen.

During the period under review an average of 6,000 lb. of milk was produced annually on a morgen of land under lucerne pasture. Table 1 gives particulars of each year's yields, cow-days, etc., per morgen.

By the term cow-days is meant the product of the number of cows and the number of grazing days. Thus in 1934 four cows grazed on a plot for 51 days, which therefore gives 204 cow-days. From the data it can be seen that a fairly high average, namely, 188

Table 1.—Milk yields and cow-days per morgen.

Year.	Total milk production (lb.).	No. of cow-days.	Average milk production per cow-day in lb.	Potential number of cow-days.
1934..........	9,049	204	44·36	—
1935..........	7,080	204	34·71	80
1936..........	3,928	122	32·20	42
1937..........	6,298	262	24·04	—
1938..........	4,888	212	23·06	28
1939..........	4,854	124	39·15	—
TOTAL.....	36,097	1,128	—	150
MEAN.....	6,016	188	32·0	25

cow-days, was obtained, although during the years 1936 and 1939 it fell considerably. Milk was produced for each of these cow-days.

Occasionally, when suitable *milk cows* were not available, other livestock such as dry cows, etc., were put directly on the pasture when it was suitable for grazing, and from the number of animal-days the potential number of cow-days was estimated; thus in the year 1935 the cow-days was estimated from 26 head of cattle which had grazed for 4 days on one morgen of land.

From the data presented in Table 1 it will be observed that there is a distinct scatter in the yearly milk yields. These differences may be due to (*a*) poorer seasons which are reflected by a diminished number of cow-days per year, (*b*) lower milk producers, and (*c*) an injudicious system of grazing.

Production Costs of Lucerne Grazing.

What it costs to graze a cow will naturally depend upon the expenditure incurred in establishing and maintaining a mixed lucerne pasture. In this experiment the ground was prepared only once, i.e. at the end of 1933, before the six-year grazing period by cows, so that the average annual expenditure has to be estimated.

Cost per Morgen of Establishing and Maintaining a Lucerne Pasture.

		£	*s.*	*d.*
(*a*) Cost of preparation of land (£4) spread over 6 years		0	13	4
(*b*) Cost of fertilizers applied twice per annum:—				
300 lb. superphosphate at £6-15s. per ton	20·25/-			
50 lb. muriate of potash at £21 per ton	10·50/-			
30 lb. nitrate of soda at £16 per ton	4·80/-			
Cost of application	·50/-			
	36·05/-			
∴ 2 × 36·05/- = 72·1/-		3	12	0
(*c*) Interest on land:—				
At 5 per cent per annum on £20 per morgen...		1	0	0
(*d*) Chain harrowing three times at 4d. per morgen		0	1	0
Total annual expenditure		£5	6	4

From Table 1 it will be observed that the possible average number of cow-days per season is 213 (i.e. 188+25). If, therefore, the above annual expenditure is divided by 213 and multiplied by 30, it will be possible to determine the grazing costs for 30 cow-days or a cow-month.

For example, the annual expenditure £5 6s. 4d. divided by 213 and multiplied by 30=14·63/-, i.e. grazing costs per cow per month =15/- (approximately).

The cows in the experiment were Frieslands averaging 1,200 lb. in weight, and yielding on an average 3 gallons of milk per day.

It is generally known that cows need varying amounts of total digestible nutrients, the quantity depending on the weight of the animal and its production of milk. Now, the requirements of total digestible nutrients (T.D.N.) for a cow of approximately 1,200 lb. weight are as follows:—

For maintenance ... ... 9·00 lb.
Per gallon of milk ... ... 3·00 lb.

Thus, for a cow yielding on an average 3 gallons of milk daily, the amount of T.D.N. necessary per day is 9·00 lb. for maintenance, plus $3 \times 3 \cdot 00$ lb. for milk, i.e. a total of 18 lb. If the grazing costs of a 1,200-lb. cow producing 3 gallons of milk are 15/- per month, then one would expect the grazing costs of a 1,200-lb. dry cow to be only $^9/_{18}$ or $\frac{1}{2}$ of 15s., i.e. 7s. 6d. per month.

In the following table the writer has attempted to draw up the grazing costs per month for 1,200-lb. cows with varying milk yields.

TABLE 2.—*Grazing costs for cows with varying milk yields.*

Average daily production.	T.D.N. daily requirement.	Grazing costs.	
		Per 30 days.	Per day.
Gallons.	lb.	s. d.	s. d.
0	9	7 6	0 3
1	12	10 0	0 4
2	15	12 6	0 5
3	18	15 0	0 6
4	21	17 6	0 7
5	24	20 0	0 8

As the cows in the experiment under discussion were left on the plots, no expenses were incurred for stabling. The estimated cost for labour for milking, watering and transferring to new paddocks was 5s. for a cow per month. With cows not on pasture the wages bill would undoubtedly be higher. If the cows are valued at £50 each, then the interest charges at 5 per cent. per annum will be equal to 4s. 2d. per month.

In Table 3 the annual profits to the nearest shilling have been calculated by making use of the data on the cost of grazing and labour and interest on capital invested in cows, the price of milk being assumed to be either 1s. or 2s. per gallon.

In this calculation of the profits no account was taken of the depreciation of cows and certain miscellaneous items of expenditure such as, for example, the erection of wire fences for suitable paddocks.

TABLE 3.—*Profit on milk to nearest shilling (per morgen).*

Year	1934	1935	1936	1937	1938	1939	Mean
	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.	£ s.
At 1s. per gallon	35 17	26 15	14 13	21 12	16 10	19 10	22 9
At 2s. per gallon	81 2	62 3	34 5	53 2	40 19	43 15	52 11

Obviously the statement of the profits must be taken with a certain amount of reserve, because, although a considerable economy is effected by having the cows on pasture from 4-6 months, yet when the grazing season is over, other arrangements have to be made for feeding of the animals, which will substantially reduce the amount of the gains. The carrying capacity is related to the amount of pasture available, which undoubtedly varies from year to year according to the nature of the season. Incidentally, even during different periods of the season the carrying capacity will not remain uniform, but will be more highly concentrated during the spring months of active growth.

No allowance has been made for the restorative effect of lucerne on the soil, which was not only physically improved but also chemically enriched by the manure of the animals and the addition of fertilizers, so that subsequent crops, either cereal or other, should benefit considerably.

From unpublished data kindly supplied by the Department of Agronomy of the Stellenbosch-Elsenburg College of Agriculture, wheat following a four-year stand of lucerne gave yields more than twice as great as wheat in the wheat-fallow system. The lucerne also has a strong residual effect and enhances the yields of subsequent grain crops in the rotation.

Inclusion of Supplementary Feeds.—When supplementary feeds in the form of pressed oats and chaff are included, the financial returns per morgen can be increased by allowing more and higher milk producers to graze.

In one of the tests, two cows produced 5,890 lb. milk on one and a half morgen of pasture alone during a period of 76 days (i.e. 152 cow-days), so that the average daily production per cow was 3·875 gallons. On another one and a half morgen of pasture and supplementary feed two cows for the full period of 76 days and an extra cow, introduced at a later stage, for a period of 58 days yielded 9,007 lb. milk for the 210 cow-days, so that the average daily production here was 4·289 gallons per cow-day. In comparison with a cow on pasture only, it was calculated that the daily grazing consumption of a cow supplied with supplementary feeds as well was on an average only 0·69 the amount of that consumed by the former.

During the 210 cow-days the cows consumed, in addition, the following rations, viz. 1,353 lb. of pressed oats and 896 lb. of chaff, which represent an average consumption of 6·443 lb. of oats and 4·267 lb. of chaff per cow-day. If a bag of oats is valued at 17s. and chaff at 2s. per bale (80 lb.), then the cost of the supplementary feeds will be 0·837s. per day for an average daily milk production of 4·289 gallons on pasture and supplementary feeds. For a production of 4 gallons of milk per day the cost should be proportionally reduced to 0·8034s. per day, which is equal to 24s. per month.

It is then possible, by making use of the T.D.N. consumed on a proportionate basis by cows with a higher or lower production, to estimate the cost of the supplementary feeds, as shown in Table 4.

TABLE 4.—*Cost of supplementary rations.*

Average daily production of milk.	T.D.N. daily requirement.	Cost of supplementary feeds per cow-month.
Gallons.	lb.	s. d.
0	9	10 3
1	12	13 8
2	15	17 2
3	18	20 7
4	21	24 0
5	24	27 5

If, instead of being allowed to graze, the cow is fed lucerne hay and a meal mixture, the cost will be greatly increased.

The following ration of 25 lb. lucerne hay and 12 lb. of meal mixture can be considered as suitable for a 1,200-lb. cow producing 4 gallons of milk (butterfat 3½ per cent.) per day. This ration would supply 22 lb. of total digestible nutrients per day if mealiemeal were used instead of the meal mixture.

The cost of the ration is as follows: —

	s.	d.
25 lb. of lucerne hay at 6s. per 100 lb.	1	6
12 lb. of mealiemeal at 21s. per 200 lb.	1	3
i.e. Cost per day	2	9
i.e. Cost per month (30 days)	82	6

Similarly, by calculating as for grazing and supplementary feeds it is possible to estimate the feeding costs of other cows with a higher or lower production.

TABLE 5.—*Cost of rations, when used as only sources of feed.*

Average daily production of milk.	T.D.N. daily requirement.	Cost of rations per cow-month.
Gallons.	lb.	s. d.
0	9	35 5
1	12	47 2
2	15	58 11
3	18	70 9
4	21	82 6
5	24	94 4

From the cost of grazing alone, of grazing together with supplementary feeds, and of rations only, it is possible to draw up a table (see Table 6) of the possible profits or losses. In this table the labour cost per cow per month will be taken as 5s. per month, although in the case of a cow receiving a weighed amount of rations per day the expenses will be higher as more attention is required. The interest on the cows, valued at £50 each, is 4s. 2d. per month, so that the outlay will be 9s. 2d. per month.

Comparison of Profits and Losses under Different Systems of Feeding.

From Table 6 (page 398) it can be seen that:—

(1) Profits are highest when only grazing is practised. Incidentally if any losses are sustained, as with dry cows, they are reduced to a minimum under grazing. A further reduction could be effected by allowing dry cows to graze on the residues left by the milk producers, because this part of the pasture is less valuable than the pasture before grazing.

(2) Profits on individual cows are reduced where supplementary feeds are supplied in addition to the ordinary grazing. By the inclusion of supplementary feeds it is possible, however, to increase the carrying capacity of the pasture. In the case of cows with a production of 4 gallons of milk per day it was found that three cows, instead of two, were able to graze on the pasture. If the column (3f-2g) of block (*b*) is examined, i.e. where the differences in cash returns from three cows and two cows producing 4 gallons of milk per cow-day under different systems of feeding are estimated, it will be found that the income from the same area of land can be increased by £1. 17s. 7d. per month by the inclusion of an additional cow when milk is sold at 1s. per gallon, and by £7. 17s. 5d. when milk is valued at 2s. per gallon.

(3) When rations only are used, losses are sustained until the stage is reached where a production of 3 gallons per day is obtained. This applies only when milk is valued at 1s. per gallon, because at 2s. per gallon the sale becomes profitable at a stage between one and two gallons. With rations only, the losses sustained on the non-producers is £1. 15s. 5d. per month if labour and interest charges are disregarded. It appears that the average production of the herd must be at least 3 gallons to prevent a loss being incurred when milk is sold at 1s.per gallon.

(4) The profits are more than doubled if the price which the dairyman receives, is doubled. This can be checked by comparing the returns of the cows under the columns for 1s. and the 2s. per gallon, respectively. For example, for pasture only (see I), when the 4-gallon column is examined, it is found that the profits with milk at 1s. per gallon are £4 13s. 4d., and at 2s. per gallon are £10 13s. 4d. With supplementary feeds and grazing (see II), the profits are £3. 14s. 9d. and £9. 14s. 9d. with milk at 1s. and 2s. per gallon respectively. On rations only, the profits are £1. 8s. 4d. and £7. 8s. 4d. with milk at 1s. and 2s. per gallon, respectively.

(5) Lower producers are more of a liability than an asset and, consequently, it should be the aim of dairymen to eliminate these and to introduce better producers into the herd for increasing profits.

(6) On lucerne pastures it was possible during a period of six years to produce milk at an average of 3 gallons per cow per day. The writer is convinced that this figure can be improved upon by the use of a good class of animal and by a judicious system of grazing. Although an average of 4·3 gallons was obtained on lucerne pasture, chaff and pressed oats, it should be possible with mature cows to average 5 gallons. With a less fibrous type of supplementary feed during periods when the grazing itself is inclined to be fibrous, even 5 gallons should be exceeded. What production is possible with more concentrated and less fibrous supplementary feeds, it is difficult to predict.

Cost of Grazing and Cash Returns from Sheep on Mixed Lucerne Pastures.

During the 1940 season grazing was continued on the mixed lucerne pasture, but ewes and lambs were substituted for the milk-producing cows. On plots 7 and 8 of the original series, oats were sown for grazing. The crops throughout were more or less admixed with turksnaels, the quantity of which depended upon the time of the season. On plots 7 and 8 the predominant crop was oats, and on the other six lucerne.

Two groups, each consisting of 24 ewes and 29 lambs, respectively, were used at the commencement of the test and were allowed to graze on plots which were considered to have attained a sufficient growth of pasture. The average carrying capacity during the season on three morgen of mixed lucerne pasture was found to be 4,654½ ewe-days and 3,973 lamb-days (for a period of 196¼ days). If, for purposes of comparison, the above figures are reduced to a common basis, it will be easy to estimate the cost of grazing. Let one ewe-day be equivalent to two lamb-days. Then the composite number of lamb-days would be 13,282 for three morgen, and consequently one-third of this figure, i.e. 4,427, per morgen.

On plots 7 and 8 the carrying capacity per morgen was very much less. Here the number of ewe-days amonted to 977 and the lamb-days to 1,120 per morgen, when the composite number of lamb-days is 3,074 in comparison with 4,427 on the lucerne plots.

Cost of Grazing on Lucerne Pastures.

To determine the cost of grazing, the annual expenditure of £5. 6s. 4d., as estimated for the establishment and maintenance of the lucerne pasture, can be divided by the number of lamb-days, i.e. 4,427, and multiplied by 30, and in this manner it will be found that the monthly grazing expenses for a lamb will amount to 8½d., or 1s. 5d. for a ewe.

For easier calculation it is more convenient to increase the costs slightly per month, i.e. to 9d. per lamb and 1s. 6d. per ewe.

Cost of Production per Morgen of an Oat Crop for Grazing.

	£	s.	d.
(*a*) Preparation of land. (This includes ploughing, labour, harrowing, seeds and sowing.)	1	15	0
(*b*) Fertilizer:— 400 lb. of mixture E at £10 per ton	2	0	0
(*c*) Interest on land:— 5 per cent. on £20 per morgen	1	0	0
Total cost per morgen	£4	15	0

Grazing Costs on Oat Pasture.

Now since the composite number of lamb-days on oats is 3,074, the cost to feed a lamb per month

$$\frac{£4.\ 15s. \times 30}{3{,}074}$$

$$= 11 \cdot 125d.$$

∴ Cost to feed a ewe per month $= 2 \times 11 \cdot 125d. = 1s.\ 10\frac{1}{4}d.$

In comparison with the mixed lucerne grazing, it can be seen that the grazing on oat pasture is 1s. 10¼d. – 1s. 5d., i.e. 5¼d. more expensive per ewe per month.

Returns from Wool from Ewes.

From the number of days that the ewes grazed on the pasture it was possible by proportion to estimate the value of the wool produced during the period of the experiment. The value of the wool is estimated at 10s. per German merino grade ewe. From this valuation the value of the wool produced on lucerne pasture was £2. 3s. 4d., and on the oat pasture only £1. 6s. 7d. per morgen.

Deductions have also to be made for the grazing costs of both the ewes and the lambs on the two different types of pasture. Interest charges on the capital invested in the ewes, valued at £3 each, at 5 per cent. per annum for the period on pasture, must also be inculded. Incnidentally, a ewe died during the course of the experiment, for which loss an allowance has also been made.

Details of the receipts and expenses are shown in the following "Profit and Loss Account", which are estimated on a per morgen basis.

Profit and Loss Account for Ewes and Lambs.

On Mixed Lucerne Pasture per Morgen.

Credit.

	£	s.	d.
(1) By sale of lambs	18	17	0
(2) By sale of wool from ewes	2	3	4
	£21	0	4

Debit.

	£	s.	d.
(1) To cost of grazing (lambs)	1	13	1
(2) To cost of grazing (ewes)	3	17	7
(3) To interest charges on ewes		13	0
(4) To loss of ewe		16	6
	£ 7	0	2

Profit = £21. 0s. 4d. − £7. 0s. 2d. £14 0 2

On Oat Pasture per Morgen.

Credit.

	£	s.	d.
(1) By sale of lambs	15	19	0
(2) By sale of wool	1	6	7
	£17	5	7

Debit.

	£	s.	d.
(1) To cost of grazing (lambs)	1	14	7
(2) To cost of grazing (ewes)	3	0	5
(3) To interest charges on ewes		8	0
(4) To loss of ewe		10	5
	£ 5	13	5

Profit = £17. 5s. 7d. − £5. 13s. 5d. £11 12 2

TABLE VI.—*Estimated monthly profit or loss per morgen :—(a) under different systems of feeding ; (b) due to increased carrying capacity with use of supplementary feeds.*

		Milk at 1s. per Gallon. Average production of milk per cow-day in gallons.					
		0.	1.	2.	3.	4.	5.
		£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
(a)	By sale of milk per 30 days	—	1 10 0	3 0 0	4 10 0	6 0 0	7 10 0
	I. To Cost of grazing (A)	0 7 6	0 10 0	0 12 6	0 15 0	0 17 6	1 0 0
	Profit or loss per month	—(0 7 6)	1 0 0	2 7 6	3 15 0	5 2 6	6 10 0
	Less 9s. 2d. for labour and interest (*g*)	—(0 16 8)	0 10 10	1 18 4	3 5 10	4 13 4	6 0 10
	II. To cost of supplementary feeds	0 10 3	0 13 8	0 17 2	1 0 7	1 4 0	1 7 5
	To cost of grazing (= 0·69A)	0 5 2	0 6 11	0 8 8	0 10 4	0 12 1	0 13 10
	Total cost of feeds	0 15 5	1 0 7	1 5 10	1 10 11	1 16 1	2 1 3
	Profit or loss per month	—(0 15 5)	0 9 5	1 14 2	2 19 1	4 3 11	5 8 9
	Less 9s. 2d. for labour and interest (*f*)	—(1 4 7)	0 0 3	1 5 0	2 9 9	3 14 9	4 19 7
	III. To cost of rations	1 15 5	2 7 2	2 18 11	3 10 9	4 12 6	4 14 4
	Profit or loss per month	—(1 15 5)	—(0 17 2)	0 1 1	0 19 3	1 17 6	2 15 8
	Less 9s. 2d. for labour and interest	—(2 4 7)	—(1 6 4)	—(0 8 1)	0 10 1	1 8 4	2 6 6
(b)	Comparison of two cows on grazing (I) only, against three cows on grazing and supplementary feeds (II)—						
	Profit or loss from three cows (3 × *f*)	—(3 13 9)	0 0 9	3 15 0	7 9 3	11 4 3	14 18 9
	Profit or loss from two cows (2 × *g*)	—(1 13 4)	1 1 8	3 16 8	6 11 8	9 6 8	12 1 8
	Difference (3*f* — 2*g*)	—	—(1 0 11)	—(0 1 8)	0 17 7	1 17 7	2 17 1

		Milk at 2s. per Gallon.					
		Average production of milk per cow-day in gallons.					
		0.	1.	2.	3.	4.	5.
		£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.	£ s. d.
(a)	By sale of milk per 30 days	—	3 0 0	6 0 0	9 0 0	12 0 0	15 0 0
	I. To Cost of grazing (A)	0 7 6	0 10 0	0 12 6	0 15 0	0 17 6	1 0 0
	Profit or loss per month	—(0 7 6)	2 10 0	5 7 6	8 5 0	11 2 6	14 0 0
	Less 9s. 2d. for labour and interest (*g*)	—(0 16 8)	2 0 10	4 18 4	7 15 10	10 13 4	13 10 10
	II. To cost of supplementary feeds	0 10 3	0 13 8	0 17 2	1 0 7	1 4 0	1 7 5
	To cost of grazing (= 0·69A)	0 5 2	0 6 11	0 8 8	0 10 4	0 12 1	0 13 10
	Total cost of feeds	0 15 5	1 0 7	1 5 10	1 10 11	1 16 1	2 1 3
	Profit or loss per month	—(0 15 5)	1 19 5	4 14 2	7 9 1	10 3 11	12 18 9
	Less 9s. 2d. for labour and interest (*f*)	—(1 4 7)	1 10 3	4 5 0	6 19 11	9 14 9	12 9 7
	III. To cost of rations	1 15 5	2 7 2	2 18 11	3 10 9	4 2 6	4 14 4
	Profit or loss per month	—(1 15 5)	0 12 10	3 1 1	5 9 3	7 17 6	10 5 8
	Less 9s. 2d. for labour and interest	—(2 4 7)	0 3 8	2 11 11	5 0 1	7 8 4	9 16 6
(b)	Comparison of two cows on grazing (I) only, against three cows on grazing and supplementary feeds (II)—						
	Profit or loss from three cows ($3 \times f$)	—(3 13 9)	4 10 9	12 15 0	20 19 9	29 4 3	37 8 9
	Profit or loss from two cows ($2 \times g$)	—(1 13 4)	4 1 8	9 16 8	15 11 8	21 6 8	27 1 8
	Difference ($3f - 2g$)	—	0 9 1	2 18 4	5 8 1	7 17 5	10 7 1

I. Cost of grazing from Table 2. II. Cost of supplementary feeds from Table 4. III. Cost of rations from Table 5.

From these results it appears that approximately one-third must be deducted from the gross income in order to obtain the net income from a morgen of pasture, irrespective of whether the latter is mixed lucerne or oats. The profit from the lucerne pasture was £2. 8s. per morgen more than that obtained from the oat crop, notwithstanding the six-year grazing period of the cows. On both types of grazing a loss is incurred on the ewes, because the grazing costs exceeded the value of the wool, which is assumed to be growing at a proportionate rate throughout the year.

From the data presented it thus appears that the returns from dairy cows on lucerne pasture are very attractive; they are distinctly higher than those from fat-lambs. It would probably be more advisable to adjust the grazing periods of both classes of animals, namely, by curtailing the grazing period of good milk-cows on the mixed pasture and thus maintaining a higher daily average production of milk per cow, and then by allowing ewes and fat-lambs to follow on the residual grazing.

Summary and Conclusions.

(1) The average annual seasonal production for a six-year period was 6,000 lb. of milk per morgen.

(2) For this period, the profits per morgen, on mixed lucerne pasture, obtained after deduction of the wages of labour and interest charges on the capital invested in cows, averaged £22. 9s. and £52. 11s. annually at 1s. and 2s. per gallon of milk, respectively.

(3) Profits are considerably reduced by feeding rations only, while the economical nature of pasture is clearly perceptible. Profits depend mainly on the system of feeding practised.

(4) Low milk producers should be weeded out as they reduce the profits made on the higher producers. This is easily comprehensible because most of the food is used for the animal's maintenance instead of producing milk.

(5) The average daily production per Friesland cow was slightly more than 3 gallons on pasture.

(6) On lucerne the gross returns of £21. 0s. 4d. from fat-lambs were reduced to £14. 0s. 2d. per morgen and on oats from £17. 5s. 7d. to £11. 12s. 2d. per morgen. The expenses incurred in fat-lamb raising were thus roughly one-third of the gross returns.

(7) Farming with both dairy cows and fat-lambs will probably increase the profits. When the grazing period of good milk cows on pasture is curtailed, the daily milk production should remain fairly constant, or fall only a little, as the animals will then graze only the most nutritious part of the plants. Either ewes and their lambs or poor producers can follow up on the residual pasture.

Acknowledgments.—The writer wishes to express his indebtedness to Drs. Slabber, Swart and van Wyk for useful suggestions and for scrutinizing this article; to Mr. C. J. Starke for his advice on the valuation of the costs of preparing land for lucerne and oat grazing; and to Mr. W. F. Fouche for data on grazing and milk yields.

REFERENCE.

Morrison: Feeds and Feeding.

Agricultural Engineering.

III (a). Specifications for Circular Brick Reservoirs with Nine-Inch Wall and Exterior Spiral Reinforcement.

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THESE specifications have been prepared in response to numerous requests for particulars of reservoirs with nine-inch brick walls. Unnecessary details have been avoided with a view to brevity as most people dislike lengthy specifications.

Foundation.

A piece of piping 10 or 12 feet in length and 1½ inches in diameter, is fixed in concrete at the point where the centre of the reservoir has to be. See that the pipe stands in a truly vertical position.

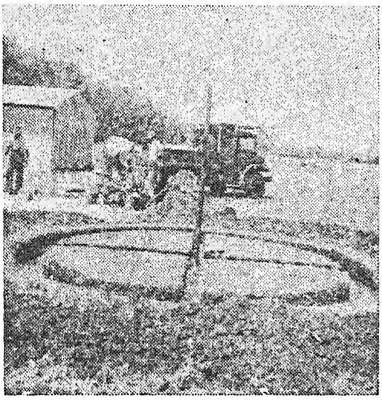

FIG. 1A.—The excavated foundation ring.

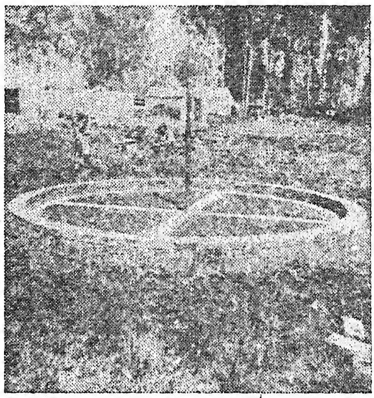

FIG. 1B.—Two brick courses on completed concrete foundation ring. (See also Fig 5.)

Mark out and excavate the trench for the foundation ring 16 inches wide and 12 inches deep (Fig. 1A), and, if the underlayer is shale, or good firm soil that will not contract and crack, the trench can be filled in with concrete consisting of 1 cement to 2½ sand to 5 stone without any reinforcement.

If, however, black turf or red clay is encountered, the foundation ring should consist of 1 cement to 2 sand to 4 stone reinforced top and bottom with mild steel rods as indicated in Fig. 2. The top of the foundation should be smoothed off.

The method of placing the short length of outlet pipe in the foundation is indicated in Fig. 3. For stock-watering the outlet pipe should be 2½ inches in diameter, while for irrigation a 4-inch pipe should be used.

First and Second Courses of Brickwork.

The concrete foundation ring should be completed in one day if possible, and the first course of bricks (a header course) should be laid not later than the next morning while the concrete is still green so that a perfect bond may be effected. The bricks are laid to a knot in a thin wire fastened to a slip-ring around the central pipe as indi-

cated in Fig. 4. The slip-ring may be held at the correct height by tying a piece of $\frac{1}{4}$-inch rope around the pipe below the ring.

A $\frac{1}{4}$-inch bolt 3 inches long should be embedded in the mortar at foundation level with the bolt head protruding about $\frac{1}{4}$ inch from the bricks so that the reinforcing wire can be conveniently fastened to it.

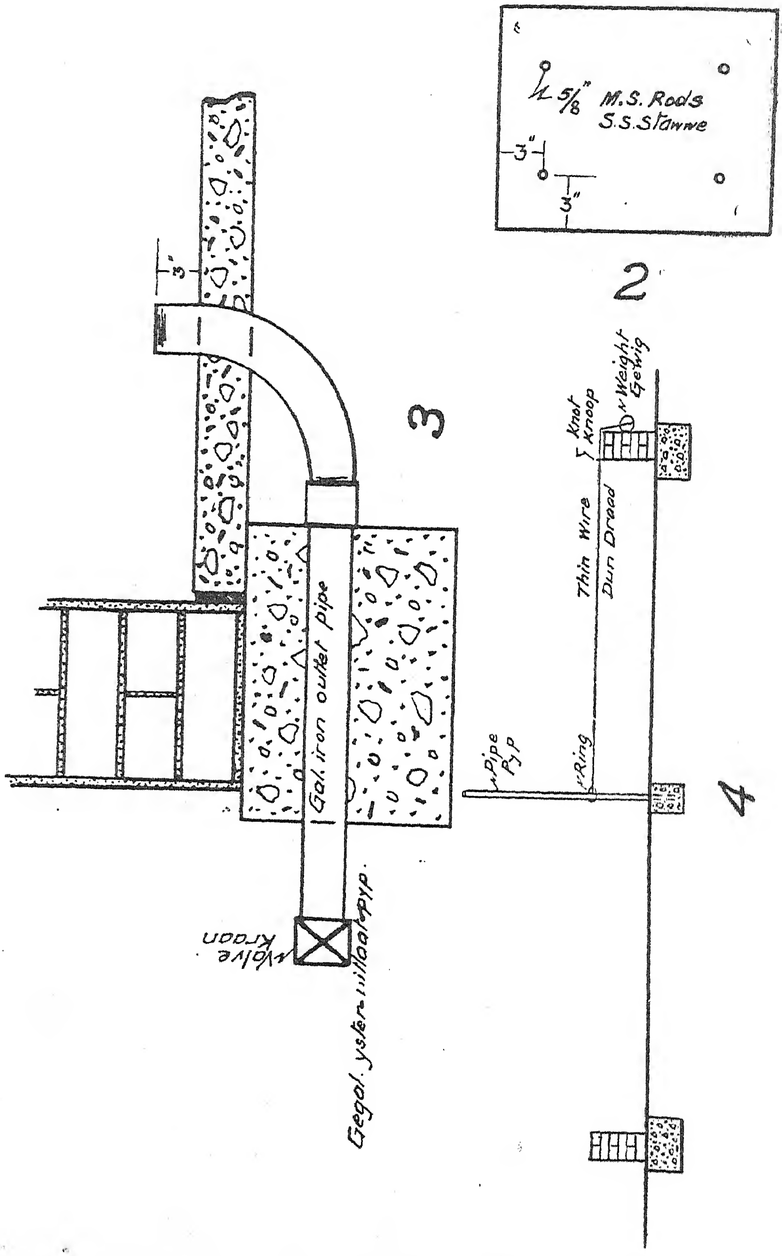

FIG. 2.—Foundation reinforced top and bottom with mild steel rods.

FIG. 3.—Short length of outlet pipe in position in foundation.

FIG. 4.—Bricks laid to a knot in a thin wire fastened to a slipring around the central pipe.

The second course of the brick wall (a stretcher course) (Fig. 1B), should now be laid and the two courses plastered a half inch thick on the inside only (Fig. 5). The mortar for laying the bricks in, as well as that for plastering, should consist of 1 cement to 3 sand. Care should be taken to see that the bricks are wet when being laid and plastered.

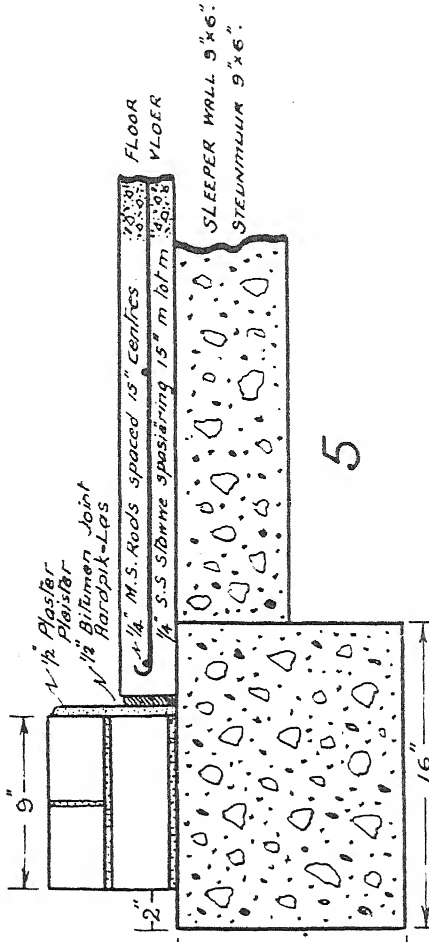

Fig. 5.—First two brick courses plastered on inside only. (See also Fig. 1B.)

The foundation is then covered with old sacks to protect it from the sun; the rest of the brickwork is completed after the floor of the reservoir has been laid. The foundation should be kept wet.

Sleeper Walls.

The concrete sleeper walls (1 cement to 3 sand to 6 stone) upon which the floor rests (Fig. 6) are 9 inches wide and 6 inches thick, constructed along two diameters at right angles to each other so that the tops of the walls are level with the top of the foundation ring (Fig. 5). No reinforcement is required for these walls. The tops of the walls should be smoothed off.

Floor.

Before the floor of the reservoir is constructed the loose top soil should be removed and the spaces between the sleeper walls filled with

sand or well rammed gravel or small stone, level with the tops of the sleeper walls. The top of the inside portion of the foundation ring, as well as the tops of the sleeper walls, should be given a coat of bitumen so that the floor will be able to move freely when contracting. The floor is of concrete in the proportions 1 cement to 2 clean sand to 4 stone reinforced in two directions with ¼-inch round mild steel rods as indicated in Fig. 5. The thickness of the floor should be 3 inches for reservoirs up to 40 feet in diameter, and 4 inches for larger reservoirs.

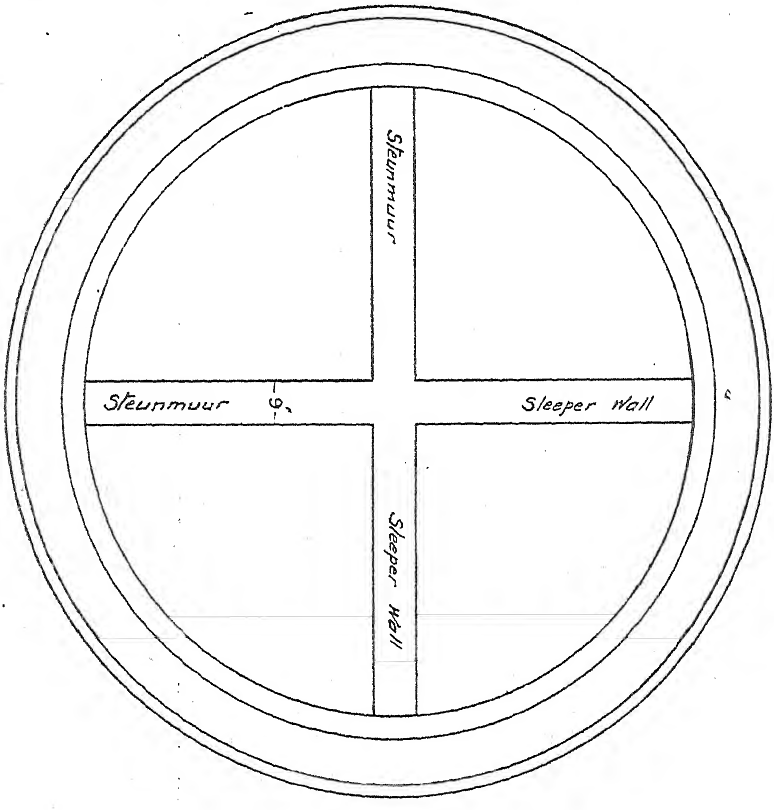

Fig. 6.—Concrete sleeper walls.

The floor is divided into four quadrants separated from one another and from the plastered wall of the reservoir by half-inch openings. The opening along the wall can be formed by folding old newspaper into strips and placing these against the wall. The paper and the strips of ceiling board forming the joints between the quadrants should be extracted while the concrete is still green.

The floor quadrants coincide with the sleeper walls so that the joints lie in the centre of the sleeper walls (Fig. 7). The floor should be covered with old sacks and kept wet for at least three weeks to allow the concrete to grow hard under favourable conditions.

Brick Wall.

As soon as the floor has been laid the brickwork can be continued with, the courses being header and stretcher alternately. At intervals of, say, 8 courses a ¼-inch bolt should be embedded in a vertical joint

with its head protruding about $\frac{1}{4}$ inch, the last bolt being in the top course about 1 inch from the crest. Saw off the pipe at the centre of the reservoir as close to the floor as possible and fill in the hole with cement mortar.

Reinforcement.

The reinforcement consists of No. 12 gauge high strain steel wire. One end of the wire is then fastened to the bolt head at foundation level and the wire is then carefully wrapped tightly around the brick wall in spiral fashion, the appropriate number of turns of wire being spread over each foot height of the wall (see Fig. 8 and table below).

On reaching a bolt head, the wire is given a twist round the bolt and eventually fastened to the last bolt head in the uppermost course. To provide additional tension in the wire and at the same time ensure that the wires will be properly embedded in the plaster, old nails and short pieces of No. 8 gauge wire should be driven in here and there between the wire and the wall.

The following table gives the number of turns of wire recommended per foot height of wall for reservoirs six feet deep ranging from 15 to 80 feet in diameter.

Internal diameter of reservoir in feet.	Depth in feet.	Approximate capacity of reservoir in gallons.	Height of wall, in feet, from floor upwards.						Approx. number of bricks required.	Number of rolls of wire of 1,400 yds. required.
			0–1	1–2	2–3	3–4	4–5	5–6		
			Number of turns of wire per foot.							
15	6	6,600	5	5	5	5	5	5	3,000	$\frac{3}{8}$
20	6	11,700	5	5	5	5	5	5	3,900	$\frac{1}{2}$
30	6	26,400	8	7	5	5	5	5	5,800	$\frac{13}{16}$
40	6	47,000	10	8	7	5	5	5	7,700	$1\frac{1}{4}$
50	6	73,500	12	11	7	6	5	5	9,600	$1\frac{3}{4}$
60	6	105,900	15	12	10	8	6	6	11,500	$2\frac{5}{16}$
70	6	144,100	18	15	12	10	6	6	13,400	$3\frac{9}{16}$
80	6	188,200	21	18	14	12	8	8	15,300	$4\frac{7}{8}$

Plaster.

The wall is plastered half an inch thick inside and outside with cement mortar in the proportion 1 cement to 3 sand, the bricks being kept wet while the plaster is applied. After the plaster has set, the top of the wall should be covered with old sacks and the plaster kept wet for six days before water is let into the reservoir.

Floor Joints.

The floor should be allowed to become bone dry before the openings between the quadrants and along the wall are filled in with bitumen, since bitumen does not adhere to a moist surface.

The joints should be well cleaned and the bitumen poured in hot; *it must not boil or burn*, but should be heated in a metal container

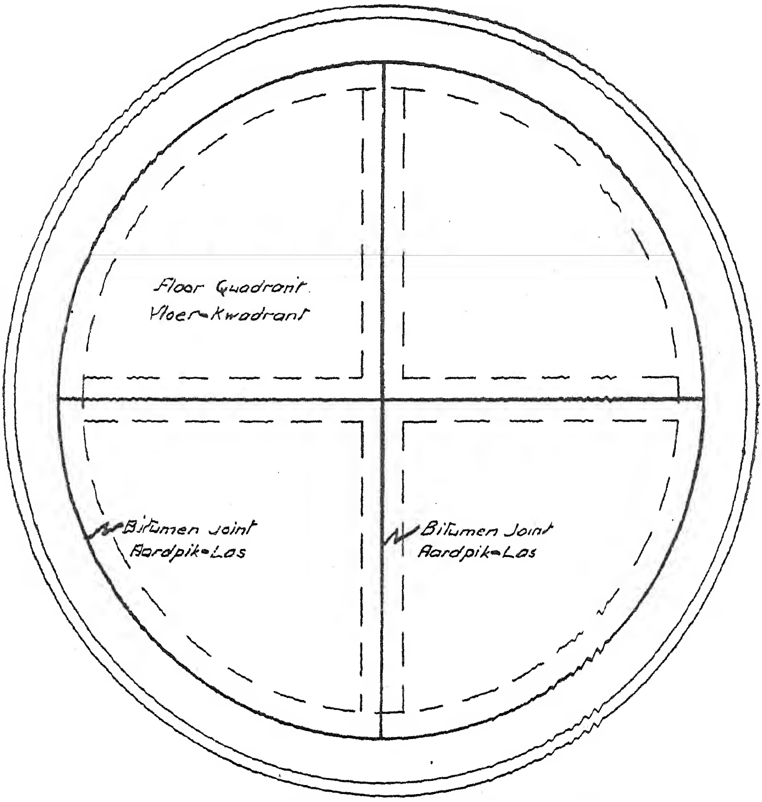

FIG. 7.—Floor quardrants showing joints for bitumen.

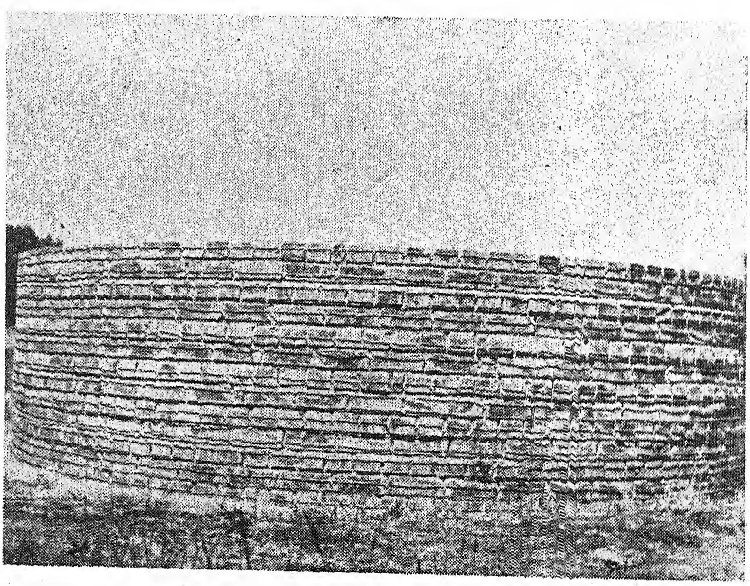

FIG. 8.—Completed wall showing reinforcing wires on outside.

suspended in water over a fire. The openings should be filled to within a $\frac{1}{4}$-inch from the floor surface. The bitumen should have 40-50 penetration.

III (b). The Permanent Repair of Corrugated Galvanized Iron Tanks and Reservoirs.

1. Clean the inside of the tank thoroughly with a steel brush and wash it with water.

2. Place the tank on a permanent smooth firm footing built of concrete or of brick or stone levelled off with cement mortar.

3. If the site is not shaded, provide shade by planting in poles and stretching a tarpaulin so as to cover the tank completely.

4. Lay a 4-inch thick concrete floor on the bottom of the tank and allow 7 days for the concrete to harden, keeping the floor wet all the time.

The concrete should consist of 1 cement to 2 clean sand to 4 small stone.

5. Mix a stiff mortar consisting of 1 cement to 2 clean fine sand and carefully fill the hollow rings of the wall of the tank only, using a small trowel. Care should be taken when entering and leaving the tank through the manhole to cause as little shaking as possible. This can be done by using a small ladder inside the tank and having a platform above the tank fixed to the poles supporting the tarpaulin.

After 12 hours the entire inside of the tank should be plastered $\frac{1}{2}$ inch thick over the ridges.

It is advisable to do the first part of the plastering late in the afternoon so that the cement sets during the cool night.

As soon as the plaster has set hard, the inside of the tank should be kept wet for 7 days before water is let in.

If desired, the outside of the tank can also be plastered. Wrap barbed wire round the tank (one wire in a groove will suffice) and fill the hollow rings. Twelve hours later plaster $\frac{1}{2}$ inch thick over all.

Corrugated galvanized iron reservoirs can be repaired in a similar way.

Ticks and Tick-borne Diseases.

Part 1.—The Argasidae and Ixodidae.

R. du Toit, Veterinary Research Officer,
Onderstepoort.

IN many parts of South Africa ticks play so important a rôle, both by virtue of the direct effects of their attacks on animals and their indirect effects due to the diseases transmitted by them, that they may be said to constitute a limiting factor to successful farming unless vigorous efforts are made to control them.

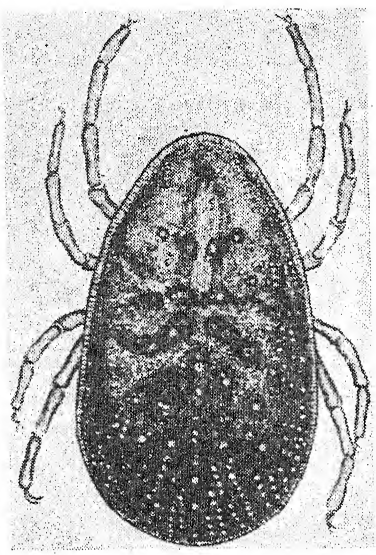

FIG. 1.—The Fowl Tick (Adult). Magnified 8 times.

The direct effects produced by tick infestation are often more serious than is realized. When numerous, the amount of blood removed from their hosts may be so considerable as even to bring about death from exsanguination; Sir Arnold Theiler records the case of a horse which died from acute anaemia and from which 14 lb. of blue ticks were collected within 3 days. This constituted only about half the ticks which actually gorged on the animal which, therefore, lost over 2 gallons of blood from tick infestation. Tick bites in themselves are painful and very prone to invasion by secondary organisms which set up abscesses, large and deep-seated suppurating wounds and give rise to the host of injuries, such as sloughed teats, missing tips of tails, foot rot, severe and painful lameness, maggot infestation, etc.

The indircet effects are even more serious and the numerous diseases directly transmitted by ticks are responsible for enormous annual losses of live-stock throughout the country, entailing the expenditure of many thousands of pounds yearly in remedies, labour and construction work for the control of these parasites. The problems are of so complicated a nature that very intensive research work has been and still is necessary in elucidating the many and varied sides to the problem. It is with the object of bringing before the public some aspects of this problem that this article now appears, in order that, with a clear understanding of the many difficulties, the control measures advocated can be intelligently applied.

Necessity for Accurate Identification of Tick Species.

There are scarcely two tick species which may be said to be identical as regards their distribution, life histories and habits and their capacities and modes of transmission of disease. It is absolutely essential, therefore, that we should be in a position to recognize at least the species of greatest economic importance and be in possession of knowledge concerning their habits in order to be able to apply control measures with a reasonable chance of success. Furthermore, this knowledge is necessary in order that the farmer may be able to protect his business from the disastrous consequences of the introduction of a new species of tick on to his farm, or a disease-transmitting species infected with a disease, the introduction of which might ruin him.

Classification and Description of the Main Groups of Ticks.

The ticks, though often referred to as insects, are actually widely separated from them and fall within the group *Acarina* which also includes the mites. They may be readily distinguished from insects by the presence of 4 pairs of legs, no clearly defined head, thorax and abdomen, the absence of antennae or anterior feelers and the fact that the body does not show the characteristic segments of insects. They are more closely related to the spiders and scorpions.

The group or super family, which is known as the *Ixodoidea*, is divided into two families, the *Ixodidae* and *Argasidae* and within these two groups are contained the 60 species which parasite mammals, birds and reptiles in South Africa.

The *Argasidae*, which includes the tampans, contains only 3 or 4 species which are of interest to us from the economic point of view, and its members may be readily distinguished from those of the *Ixodidae* both in appearance, habits and life histories. Argasid ticks are characterized by the fact that the outer covering, which is tough and leathery, contains no plates or shields and is more or less uniform in appearance all over the body. The mouth parts in the nymphs and adults are situated towards the front of the lower surface and are generally not visible from above. The males and females can only be distinguished from each other by the shape of the sexual orifice, which is situated on the under surface of the body between the first or second pair of legs. Eyes, when present, are four in number, situated on the supra-coxal fold. The life histories, though similar to those of the *Ixodidae* in so far that there are four stages, namely, egg, larva, nymph and adult, vary in that there are at least two nymphal stages and in some cases as many as 6 or 7. The habits of the *Argasidae* vary considerably but by far the greater number of the species do not remain attached to their hosts for any length of time, as do the *Ixodidae*, but feed for short intervals at a time and retire to their secluded places of concealment. Eggs are laid in small batches; usually after each feed.

The *Ixodidae*, which is a large group containing about 260 species of which 50 are known to occur in South Africa, includes those species of greatest economic importance to us. The species are characterized by the presence of a hard shield, which covers the entire upper surface of the body in the male and a small area at the front in the females, nymphs and larvae. The mouth parts are situated on the basis capitulum or false head and are always visible when viewed from above. Eyes, when present, are two in number

and situated on either side of the shield or scutum. The various developmental stages consist of egg, larva, nymph and adult, but the life histories vary from those of the *Argasidae* in that feeding for the particular stage is completed at one operation, which is of considerably greater duration than in the case of *Argasidae*. Eggs are laid in a single large batch.

With this brief description of the groups and their general habits the more important species may now be discussed. It is intended to enumerate only those features which will serve to differentiate the species in order that control measures based upon these facts may be intelligently applied.

The Family Argasidae.

There are only three members of this family which are of significance to us in South Africa. These are the fowl tick, the spinose ear tick and the tampan tick.

The Fowl Tick.

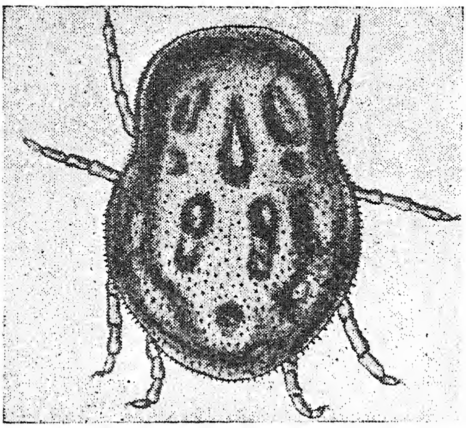

FIG. 2a.—The Spinose Ear Tick (Engorged nymph). Magnified 6 times.

The fowl tick, *Argas persicus*, Oken, Fig. 1, is often wrongly spoken of as the tampan, a term which should only be applied to the human tampan to be described later. It is essentially a parasite of fowls, but occurs also on a variety of other birds and occasionally attacks man. It has a very wide distribution throughout the world and has been taken in all parts of the Union. It is easily recognized by the elongate oval outline of the body, which is slightly more pointed in front and much flattened from above to below. It occurs principally in cracks and crevices in the walls and woodwork of fowl runs or under the bark of trees.

Life History.—The females lay batches of eggs of from 20 to 100 in their places of concealment. These eggs hatch in about three weeks, and the minute pale-coloured six-legged larvae crawl about actively in search of a host. The larvae remain attached to their hosts where they engorge themselves in from 5 to 10 days and drop off to moult into nymphs. The nymphs, which have 8 legs, resemble the adults, but are somewhat smaller and may be distinguished from the adults by the absence of a sexual orifice. Two nymphal stages occur with a moult between each and the adults then appear after the final moult. Lounsbury showed the complete life cycle, from egg to egg, to occupy about 10 months in this country.

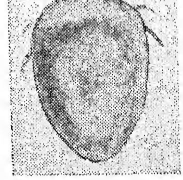

FIG. 2b.—The Spinose Ear Tick (Engorged Larva). Magnified 8 times.

Habits.—Although the larval stage remains on the host until engorgement has been completed —a fact which is made use of in combating this species, as will be described under the appropriate section—the nymphs and adults are periodical feeders. Feeding

is carried out mainly at night when the birds are sleeping on their perches or in branches of trees, and is completed in from 1 to $1\frac{1}{2}$ hours. The parasite then returns to its hiding place when a moult or the laying of a batch of eggs takes place according to the stage.

Transmission of Disease.—The fowl tick is the chief transmitter of the fowl spirochaete (*Spirochaeta anserina*) responsible for spirochaetosis, a rapidly fatal disease of poultry. Infection is acquired by the tick from an infected bird, and such infected ticks may transmit the disease to susceptible birds for 6 months or longer, or the infection may pass through the egg to be transmitted in the following generation. It has been shown that infection may even pass to a succeeding generation of ticks without reinfection of the ticks.

Bedford and Coles have shown the fowl tick to be an effective transmitter of the protozoon parasite, *Aegyptianella pullorum*, which is frequently fatal to poultry and other domestic birds.

The Spinose Ear Tick.

The Spinose Ear Tick (*Argas megnini*, Duges) (Fig. 2A) is a native of America, but has been introduced into many parts of the world and is to-day widely distributed in South Africa. It occurs only in the ears of its hosts in the larval and nymphal stages, the adults being non-parasitic, and is typically a species favouring a dry climate.

The larval and nymphal stages, which occur in the ears of cattle, horses, sheep, dogs and even occasionally in man, are easily recognized by their characteristic appearance. The engorged larva (Fig. 2B), is a small white or reddish pear-shaped object, usually appearing as a small translucent bladder, which is incapable of movement and hence frequently mistaken for an egg. The 6 legs are pale and inconspicuous and only distinctly seen with the aid of a pocket lens. To start with, the 8-legged nymph is pale, with the legs appearing exceptionally large in comparison with the body. The tick soon assumes a blue-gray colour and the body assumes the shape of a violin with a constriction in the middle. The parasite is much less flattened than the fowl tick and the edges are rounded. Small upright spines, particularly pronounced in front, cover the body and these serve to differentiate the species from the human tampan. The adults, which are not found in the ears, resemble the nymphs, but may be distinguished from them by the minute pits which take the place of the spines of the nymphs, the presence of a sexual orifice on the underside, and the fact that the mouth parts are only partially developed.

Life History.—The larva, which is a minute six-legged object with elongated mouth parts, crawls about actively in search of a host and makes directly for the ears, where it attaches itself deep down in the external ear. Here it engorges itself in from 5 to 10 days and then becomes quiescent until the outer skin is cast and the nymph emerges. The nymph immediately commences feeding, which may be completed in as short a period as a week, but is generally much longer. The nymphs have been observed in the ears for as long as 3 months and certain American observers state that this period may be as long as 7 months. After engorgement the nymphs leave the ears and secrete themselves in cracks or crevices in kraal or stable walls or in posts close to the ground or under the bark of trees. The nymphs moult to adults within a period of from 4 to 11 days and fertilization takes place shortly afterwards. Eggs are deposited

within a period of about 14 days and these hatch in from 7 to 56 days depending upon temperature. Although the adults are not parasitic and are unable to feed, owing to only partial development of the mouth parts, the eggs are nevertheless laid in small batches in common with the practice of other members of the family. The complete life cycle from egg to egg may be as short as 7 to 8 weeks or may occupy a period of a year or even longer.

Due, presumably, to the fact that mating of the sexes occurs away from the host, which makes it necessary for the sexes to find each other, a matter which is possible only in more or less confined spaces, infestations with ear ticks are typically kraal or stable infections and are seldom contracted in the open veld. Such localities may remain infected for several years, as this tick possesses phenomenal powers of resistance to hunger and adverse climatic conditions.

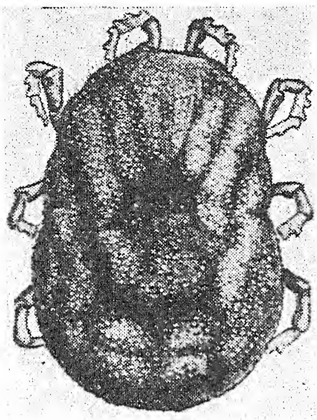

FIG. 3.—The Tampan Tick (Engorged Adult). Magnified 6 times.

Although the spinose ear tick is not responsible for the transmission of any disease, it may be responsible for considerable economic loss and may even bring about the death of animals. Infected animals are restless and feeding is interferred with due to the constant irritation caused by the bites of the ticks and substances injected by them, and they lose condition rapidly. Occasionally perforation of the ear drum has been observed and secondary invading bacteria have penetrated the inner ear and caused death due to meningitis.

The Tampan Tick.

This tick (*Argas moubata*, Murray), Fig. 3, is typically a parasite of human beings, but has been known to attack a variety of domestic animals and has even been taken off tortoises in the Kimberley area. In appearance it resembles the spinose ear tick, but may be distinguished from it by the body covering being mammillated or covered with small raised areas.

It is fairly widely distributed in the drier parts of South Africa such as the north-west Cape, Bechuanaland and the western and northern Transvaal. It is most frequently met with around trees in the dry sandy areas and is common in the Vryburg, Kuruman, Hay and Gordonia districts, but it appears to be spreading and constitutes a common infestation in native huts in many parts to-day.

Life History.—Feeding is carried out rapidly and by preference at night, but animals are frequently attacked while resting in the shade of trees. After feeding, the eggs are deposited by the females, in the ground near the bases of trees, under the bark, or in cracks in walls in native huts. Batches of eggs vary in number from 20 to over 300, and a single female has been known to lay as many as 1,217 eggs in all. Hatching occurs after 8 to 25 days and the larvae either remain within the egg shell or free themselves and remain motionless until moulting occurs 3 to 13 days later. There may be several nymphal stages, those nymphs destined to become females showing a greater number of moults than the males. In this way there may be as few as 2 or as many as 7 nymphal stages.

Transmission of Disease.—The tampan tick is the transmitter of relapsing or tick fever, caused by *Spirochaeta duttoni*, to man in various parts of Africa and there is a record of a severe outbreak of this disease in natives in the Union. It has also been shown, experimentally, to be capable of transmitting spirochaetosis, caused by *Spirochaeta anserina*, to fowls.

A closely allied species, the eyed tampan (*Argas savigni*, Audouin), which may be distinguished from the preceding species by the presence of four eyes on the supra-coxal fold, is also widely distributed in Africa, but is much less common in the Union than the eyeless tampan. It has been found attacking various species of domestic animals and man in the Steytlerville district and occasionally in the north-western Cape districts.

The Family Ixodidae.

This family includes a large number of species amongst which are included those responsible for the transmission of the most important protozoon diseases in our domesticated animals. The habit of the species of the group to remain attached to their hosts for considerable periods while feeding, make these ticks easily observed and hence, when ticks are spoken of, it is generally on the members of this family that the mind is centred.

The family *Ixodidae* is divided into a number of genera on the basis of external characters, and from the point of view of recognition of the species it is as well to adhere to this grouping. It is possible, however, to distinguish the following three main groups based on differences in life history:—

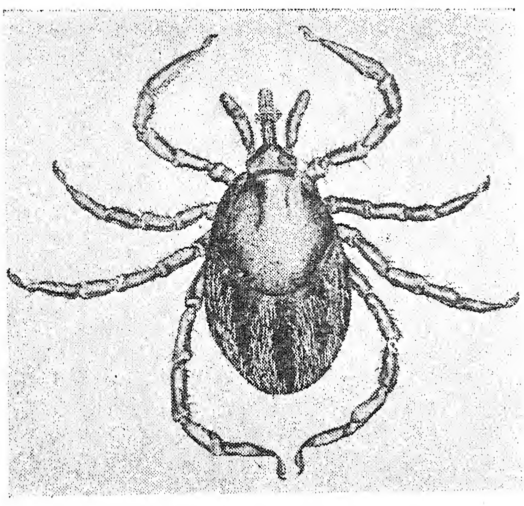

FIG. 4.—The Sheep Paralysis Tick (Partially Engorged Female). Magnified 10 times.

(*a*) *One-host ticks*, in which the larval, nymphal and adult stages all occur on one and the same host, the moults between the stages all occur on one the tick remains attached to its host. The group includes the blue tick and the Argentine tick.

(*b*) *Two-host ticks*, in which the larval and nymphal stages occur on one host and the adult on another. In this case moulting from the larval to nymphal stage generally occurs in the ears of the host, the engorged nymph then dropping from the host to moult on the ground. The adults then seek another host. The red tick and bont-legged tick are included in this group although the latter species might also act as a three-host tick.

(*c*) *Three-host ticks*, in which each stage completes its engorgement on a host from which it drops and moults on the ground again to attach itself in the following stage upon a new host. The bont tick, paralysis tick and the brown ticks are included in this group.

As space is limited and the intention of this article is to serve as a guide to the recognition of some of the more important of our

tick species, the various genera will not be discussed separately, but the more important species discussed in accordance with their capacities in bringing about economic loss amongst our livestock.

The Sheep Paralysis Tick.

This species (*Ixodes pilosus*, Koch), Fig. 4, is common in the grass-veld areas near the coast of the eastern Cape Province, where it is often referred to as the *russet* or *bush tick*, but has been recorded from all four provinces of the Union.

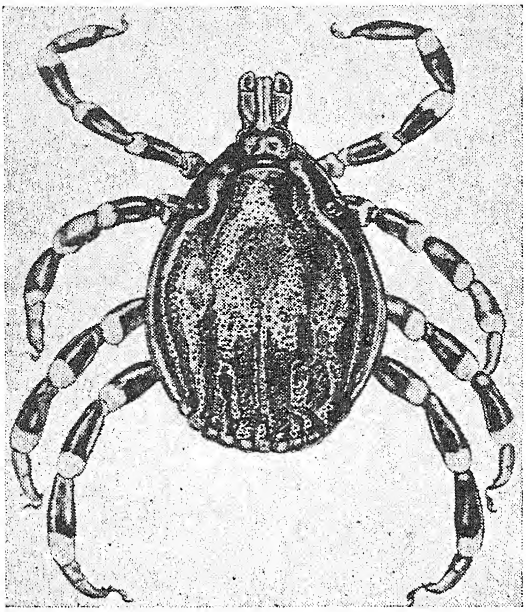

FIG. 5.—The Bont-Legged Tick (Male). Magnified 8 times.

It is a small species, the body measuring not more than about ⅛ in. in length in the unengorged state. The colour is reddish brown in both sexes, but when engorged, the female assumes a slate-blue colour, the body takes the shape of a sphere slightly more pointed in front, and the legs appear to be crowded together close to the mouth parts. The species is easily recognized by the long and flexible mouth parts, narrower and longer in the female than in the male. The legs are relatively long and slender and eyes are absent. The male than in the male. cence of a distinct ridge encircling the margin of the body behind. On the under surface, in both sexes, a horseshoe-shaped groove encircles the anus in front.

Life History.—This species may be said to be predominantly a winter tick and is most active from about April to September. Three hosts are required for its cycle, the larval and nymphal stages occurring on small veld animals, e.g. hares, field mice and rats, etc., and the adults only being found on domestic stock, where they are most frequently met with on the legs and under surfaces of the neck and body. The females engorge themselves in from 5 to 7 days.

Relation to Disease.—As its name implies, this tick is capable of producing paralysis in animals, particularly merinos and goats. The cause of this paralysis is not clearly understood but it would appear to be due to some toxin secreted by certain females only, as it is frequently observed that an animal remains unaffected when literally covered with these ticks, whereas others show severe paralysis when only a single tick can be found. It has been noted in Australia that those females associated with paralysis show a marked enlargement of the salivary glands.

When the ticks are removed the paralysis generally disappears rapidly if the condition is not already too far advanced.

The Karoo Paralysis Tick.

This species (*Ixodes rubicundus*, Neumann) is closely related to the preceding and is difficult to distinguish from it. It may be distinguished, however, by the fact that it is generally somewhat darker in colour and by the anal groove, the arms of which are parallel instead of, as in the case of *I. pilosus*, converging towards each other behind.

It is common in the eastern central Cape Province where it occurs on the stony Karoo hills. It has been noted that the sites favoured by it are the eastern slopes of the hills which catch the morning sun and it is probably in these situations that the hosts of the immature stages, viz., the Cape red hare and the elephant shrew, are most abundant. The species has, however, been recorded from the Transvaal and Northern Rhodesia, and cases of paralysis due to it have been noted in cattle and vaal rhebok in addition to sheep and goats.

The Bont-Legged Tick.

Two varieties of this species are recognized in South Africa, namely *Hyalomma aegyptium var. impressum* (Koch), Fig. 5, and var. *aegyptium* (*Linnaeus*). These two varieties are distinguished on differences in the pitting or punctation of the shields, but as, for practical purposes, the two varieties differ little in distribution and habits, these differences are of little importance. The species is characterized by the fact that the legs are banded with white or yellowish bands, the shield in both male and female is uniformly black, hemispherical eyes are present and the mouth parts are particularly long. The species is widely distributed in the Union but occurs principally in the drier parts of the country such as the western and northern Cape areas, Orange Free State and western Transvaal.

Life History.—This tick falls into the group of the two-host ticks, although on occasion three hosts may be necessary, as the larvae might drop from the first host after engorgement instead of moulting on the host to the nymph, which is the normal procedure. The adults are found on the more hairless portions of the body, e.g. under the tails of cattle, on udders or around the claws of sheep or on the tails of the haired or bastard classes. The female completes her engorgement in about 7 days and drops off to lay from 10,000 to 15,000 eggs under stones or other sheltered places. The eggs take roughly a month to hatch and the six-legged larvae are found mainly on small field animals such as field rats and mice, hares, etc. Great powers of resistance to adverse conditions are displayed by the adults, which have been kept alive without food for two years, the nymphs for three months and the larvae for a year.

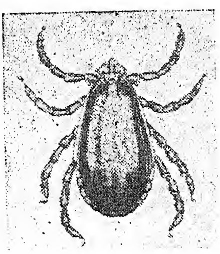

FIG. 6.—The Dog Tick (Male). Magnified 7 times.

Relation to Disease.—Although this species, or a species very closely allied to it, has been incriminated in the spread of infectious diseases in other parts of Africa, so far as is known no disease-producing organism has been transmitted by it to domestic animals as yet. It has, however, been incriminated in the transmission of tick-bite fever in man. In many parts, however, the bont-legged tick is responsible for a considerable amount of damage due to the mechanical injury inflicted by it, which is frequently the site of secondary invasion by bacteria. In this way invasion of the sensitive tissues of the hooves by the necrosis bacillus, giving rise to the condition known as foot rot, frequently follows initial tick injuries to the coronet, particularly in

sheep in the north-western Cape. Painful swellings followed by severe lameness are often associated with tick bites behind the shoulder and such infections of tick bites frequently lead to the sloughing of teats from udders or the tips of tails, depending upon the site of attachment of this species. On account of the long mouth parts and the severe inflammatory zone surrounding the bite, such tick bites are very prone to attack by the cattle maggot fly, *Chrysomyia bezziana*, in the northern Transvaal, and vigorous efforts at the control of this and other species of ticks are being demanded of the farming community.

The Dog Tick.

The dog tick (*Haemaphysalis leachii*, Audouin), Figs. 6 and 7, is a small light brown species which is easily recognized by its short mouth parts, the palps of which are triangular in shape, the absence of eyes and the absence of adanal plates or shields towards the back of the under-surface of the males. The engorged females are roughly ¼ to ⅜ inch in length, grayish blue in colour, with the characteristic short triangular mouth parts and when lifted from their sites of attachment often disclose the presence of a male situated underneath them.

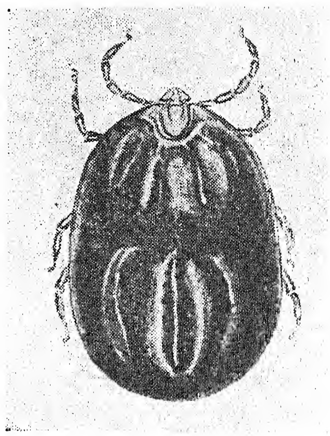

FIG. 7.—The Dog Tick (Engorged Female). Magnified 4 times.

Distribution.—This species is widely distributed throughout Africa and is common in South Africa, where it is essentially a parasite of dogs and cats and wild animals of the dog and cat tribes. In some districts of the Cape Province, particularly Oudtshoorn, its place, as the principal dog tick, is to some extent taken by the russet or paralysis tick, whereas in the Zoutpansberg district of the Transvaal the tropical dog tick (*Rhipicephalus sanguineus*), to be described later, often supersedes it.

Life History.—The dog tick is a three-host tick, the larvae and nymphae both dropping from the host to moult on the ground. The female, after engorging, which takes 5 to 6 days, drops to the ground where, after about 3 to 7 days, depending upon climatic conditions, she commences laying on an average about 5,000 eggs and then dies. The eggs hatch after about a month and the larvae feed for a period of from 2 to 7 days when they drop from their host and moult to the nymphal stage. The nymphs engorge in from 2 to 7 days, drop and moult to adults in about two weeks. The males may remain attached to their hosts for long periods after the females have dropped and, as is characteristic for the males of the *Ixodidae* in general, where the hard outer covering allows of little expansion, take very little blood.

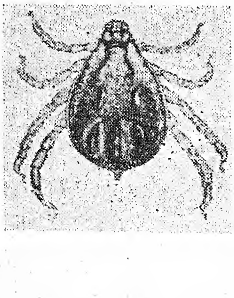

FIG. 8.—The Blue Tick (Male). Magnified 7 times.

Relation to Disease.—This tick is the chief transmitting agent of the highly fatal biliary fever or piroplasmosis of dogs in South Africa caused by *Piroplasma canis*, a blood parasite specific to dogs and jackals. The infection is derived by females from infected dogs and

passes through the egg stage to the next generation, where neither the larva or nymph is capable of transmitting it but only the adults. A somewhat similar disease of cats caused by the blood parasite *Nuttallia felis* is probably also dependent upon this tick for its transmission. The larvae are capable of transmitting tick-bite fever to man.

Transkei Cattle Tick.

This tick (*Haemaphysalis silacea* Robinson) is a related species which occurs principally on cattle and is rather rare and confined to a few districts in the south-eastern Cape Province. It may be distinguished from the foregoing by the shape of the mouth parts which, though short, do not show the triangular appearance characteristic of the dog tick. One other species of this genus (*Haemaphysalis aciculifer* Warburton) has been recorded principally from cattle on the eastern slopes of the Drakensberg in the Pilgrims Rest district of the Transvaal. In this species the palps show a tendency towards being triangular in shape and the male is provided with a long pointed spur on the 4th coxa or basal portion of the fourth leg. These two species have not been shown to be associated with the transmission of disease to livestock.

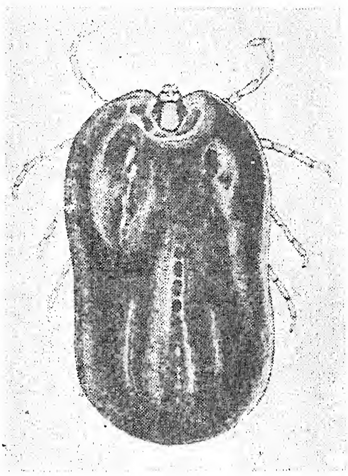

FIG. 9.—The Blue Tick (Engorged Female). Magnified 5 times.

The Blue Tick.

This tick (*Boophilus decoloratus* Koch), Figs. 8 and 9, is one of the commonest species in the Union although it is rare in Zululand and does not occur in some of the very arid regions. It occurs all over the heads, necks and bodies of cattle and horses but is found more rarely on sheep, goats and dogs.

Description.—This species is characterized by the possession of very short mouth parts and pale yellow legs. The males are small, roughly $\frac{1}{8}$ inch in length, pale brownish yellow in colour and are generally to be found attached to the skin underneath the females. Eyes are present and the areas surrounding them are generally slightly reddish or brownish, particularly in the female. The male is further characterized by the presence of strongly pointed adanal shields on the lower

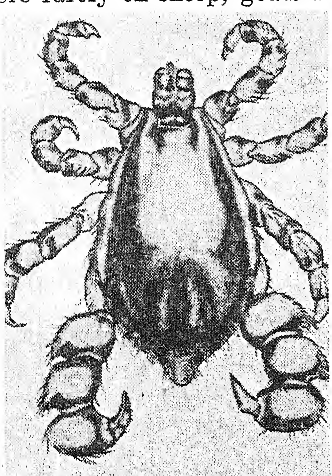

FIG. 10.—The Argentine Tick (Male).

surface and also a pair of accessory adanal shields on either side, and the body ends posteriorly in a short though distinct tail or median pointed prolongation. The female when engorged is bluish in colour, elongated, with frequently a slight constriction about the middle, giving it a characteristic appearance, and is roughly ½ inch in length.

Life History.—One host only is required for the completion of the parasitic stage, the larvae attaching themselves to the skin where, after engorgement, they moult to nymphs which in turn moult to adults without any material change of position. The complete life cycle on the animal occupies a period of from 22 to 38 days, depending upon the season of the year and the average period between the attachment of the larvae and the appearance of the first engorged adult females is 23 days. After engorgement the female drops from the host and egg-laying, which comprises from 1,000 to 2,500 eggs, commences after approximately six days. The eggs hatch in about 6 weeks' time giving rise to minute six-legged larvae, which crawl about actively in search of a host. These larvae have been kept alive without food for six months but will normally not survive for more than 3 months.

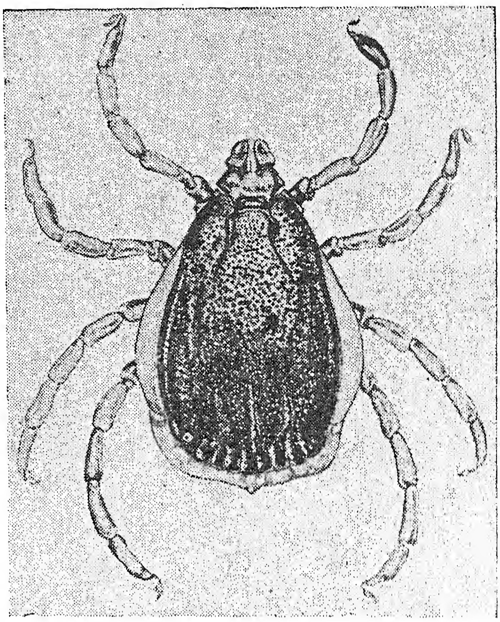

Fig. 11.—The Red Tick (Male). Magnified 9 times.

Relation to Disease.—The blue tick is the principal transmitting agent of redwater and gallsickness to cattle in South Africa, caused by *Piroplasma bigeminum* and *Anaplasma marginale* respectively. It is, furthermore, a transmitter of spirochaetosis to cattle, horses and sheep caused by *Spirochaeta theileri*. The mode of transmission is by the larvae of the ensuing generation after the infection has been acquired by one or other of the stages of the preceding generation. It has also been demonstrated that the infection may be transmitted by the larvae of the third generation, in the event of the infective larvae completing development on a non-susceptible animal such as a horse. European redwater or babesiosis has of recent years made its appearance in the Union due, possibly, to the introduction of the causal agent, *Babesia bovis*, by means of imported cattle and although the transmission has not yet been proved, the blue tick is probably one of the vectors. Tick-bite fever in man (*Rickettsia* species) is also transmitted by this tick.

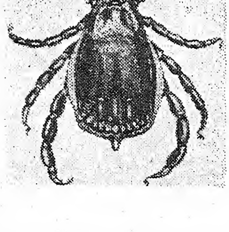

Fig. 12.—The Brown Tick (Male). Magnified 5 times.

The Argentine or Lounsbury's Tick.

The males of this species, (*Margaropus winthemi*, Karsch), Fig. 10, are easily recognized by the excessive development of the 4th pair of legs, the segments of which are enormously thickened. The species is pale yellowish or brownish and the legs in both sexes are pale with dark bands at the joints. The females may be distinguished from those of the blue tick by their larger size and the banded and relatively stouter legs.

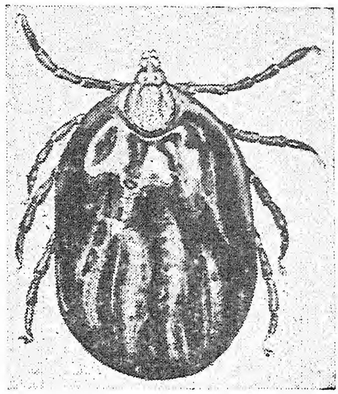

FIG. 13.—The Brown Tick (Engorged Female). Magnified 5 times.

Distribution.—This tick is not indigenous to the country but is believed to have been imported from its habitat in the Argentine on horses and mules during the Boer War. It is a fairly common species to-day on horses in parts of the Orange Free State, Basutoland and the Graaff-Reinet district of the Cape Province, but has on several occasions been found on cattle, notably in the Kuruman district.

Life History.—This has not been worked out as yet, but like the blue tick, this species has been shown to require only one host for its development. Unlike the blue tick, however, it is always more active in the winter months and high temperatures appear to affect it adversely.

There is reason to believe that it is associated with the transmission of redwater to cattle although this has not yet been proved.

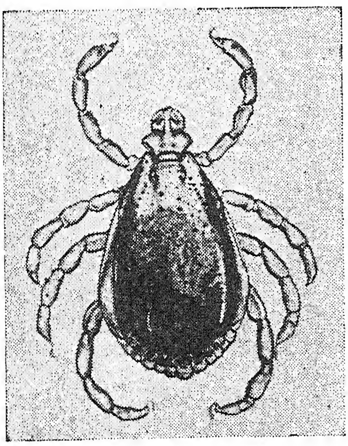

FIG. 14.—The Tropical Dog Tick (Male). Magnified 10 times.

The Red Tick.

The red tick (*Rhipicephalus evertsi*, Neumann), Fig. 11, is probably the commonest and most widely distributed tick on cattle and horses in South Africa.

Description.—It is a medium-sized species and is characterized by its red legs, which distinguish it from other members of the genus. Eyes, which are hemispherical in shape, are present and the shield is very dark brown or black with very numerous small pits, many of which are confluent, covering the surface. The mouth parts are short, as is characteristic of this group. The body of the males, other than the shield, is red as is that of the unengorged female, whereas the engorged female is bluish with a brownish tinge.

The species occurs on the hairless portions of the body and is most frequent under the tail and around and below the anus.

Life History.—Two hosts are required for the completion of the life cycle. The female, upon engorgement, drops from the animal

and lays from 5,000 to 7,000 eggs which hatch in about 30 days in summer. The larvae attach themselves in the ears of their hosts and, after engorgement, moult to nymphs in this position. The period occupied for engorgement of the larvae and nymphs is from 10 to 15 days, after which the engorged nymphs drop to the ground and moult into adults in from 22 to 25 days.

The larvae can withstand starvation for up to 7 months and the adults for about one year.

Relation to Disease.—This species may be placed second in importance to the blue tick as a transmitter of redwater (caused by *Piroplasma bigeminum*) to cattle. The infection is derived in the larval or nymphal stage from a reacting animal and transmitted by the adult, or the infection may be acquired in the adult stage, pass through the egg, and be transmitted by the larvae of the ensuing generation. Biliary fever of horses, caused by *Nuttallia equi*, is acquired by this species in the larval or nymphal stage and transmitted by the adult. Experimentally the red tick has been proved to be able to transmit East Coast fever (*Theileria parva*) to cattle, but probably plays a minor rôle in this respect in Nature. Furthermore, the species transmits *Theileria mutans*, which produces a mild form of gallsickness, characterized by a mild temperature reaction and slight anaemia. It also transmits spirochaetosis (*Spirochaeta theileri*) to cattle, horses and other classes of domestic animals.

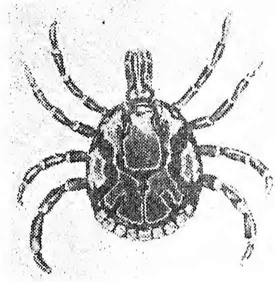

FIG. 15.—The Bont Tick (Male). Magnified 4 times.

The Brown Tick.

This species (*Rhipicephalus appendiculatus*, Neumann), Figs. 12 and 13, differs from the red tick in having brown legs, which also characterize the other members of this group. Apart from minor differences, which require the aid of a pocket lens to determine, the males may be differentiated by the fact that the punctations on the shield are more dense towards the centre and a small space devoid of punctations is present on either side. The fourth pair of legs is generally somewhat thickened, although this is not a constant character, and when engorged the male bears a distinct pointed tail behind. The females, which are uniformly brown when unengorged, assume a slate blue colour when engorged but can only be distinguished from the other members of the group, apart from the red tick, by an expert. It is advisable, therefore, to identify this species by the male which may generally be found underneath the female.

Distribution.—This tick is widely distributed in South Africa but is more abundant in the lower-lying areas of the eastern and northern portions of the Union, where it occurs on a variety of domestic and wild animals, being confined mostly to the head region, such as the ears and around the eyes. When numerous, however, the ticks may be distributed over the body as well.

Life History.—The brown tick is a three-host tick, the larvae and nymphae occurring chiefly in the ears of their hosts, which are typically cattle. The female engorges herself in from four days to a week or more depending upon climate. She lays from 3,000 to 5,700 eggs on the ground which hatch in about 28 days in summer to several months in winter. The larvae engorge in from 3 to 7 days, drop and moult to nymphs in 2 to 3 weeks. The nymphs remain on their hosts from 3 to 7 days and in from 10 to 18 days

moult to adults which engorge in from 4 to 8 days. The larvae withstand starvation for 7 to 11 months, the nymphs for about 6½ months and the unengorged adults for an average period of 12 to 14 months.

Relation to Disease.—This species is the principal transmitter of the highly fatal East Coast fever of cattle caused by *Theileria parva*. The infection is acquired by the larva and transmitted by the resulting nymph or acquired by the nymph and passed on by the adult. The larvae of the ensuing generation are not infective even though a female may have engorged herself on a reacting animal. The infection is passed on to the susceptible animal only after the infective nymph or adult has been feeding for roughly 72 hours and, upon completion of the feed, the tick has lost all of the infection. As with the red tick this species transmits redwater (*Piroplasma bigeminum*), and mild gallsickness (*Theileria mutans*), to cattle. In addition it has been shown to transmit Nairobi sheep disease, an infectious gastro-enteritis of sheep caused by an ultra-visible virus, in Kenya Colony and, experimentally, it can transmit the virus disease of sheep, Louping Ill, which occurs in Great Britain.

Other Species of Brown Ticks.

The Cape brown tick (*Rhipicephalus capensis*, Koch) and the black-pitted tick (*Rhipicephalus simus*, Koch) are closely allied to the brown tick from which they are not easily distinguishable by the uninitiated nor, for practical purposes, is this of much importance as they are both three-host ticks and both capable of transmitting East Coast fever. In addition the black-pitted tick has been shown to transmit gallsickness of cattle caused by *Anaplasma marginale* and further research will no doubt reveal their capacitites for transmitting other diseases as well. The Cape brown tick has a slightly lighter shade of brown than the brown tick, and the shield is densely covered with closely set punctations or pits, whereas the black-pitted tick is a very dark brown and the punctations are very much fewer in number and, in the male, arranged in irregular longitudinal rows.

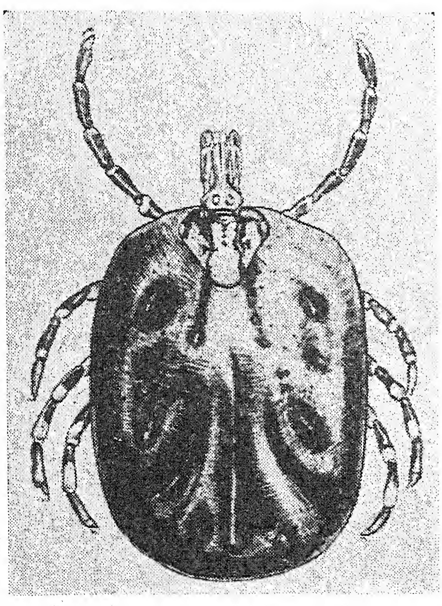

FIG. 16.—The Bont Tick (Engorged Female). Magnified 5 times.

Distribution.—The Cape brown tick occurs principally in the extreme western Cape Province and extends more or less along the coastal areas into Natal, although it has been taken in other localities but is not common. The black-pitted tick occurs more or less over the whole Union except the drier western portions. Both species occur on the larger domestic animals and several species of wild game and small veld animals, but the black-pitted tick is commonly encountered on dogs as well.

Recently a new species of tick has been discovered in the Aberdeen district and in a few localities in the eastern Cape Province, which has been named *Rhipicephalus glabroscutatum*,

du Toit, due to the shiny nature of the shield, which is almost entirely devoid of punctations. The species may be distinguished further from the preceding 3 species by the hemispherical eyes as opposed to the flat eyes of the other species.

This tick has been found to occur in clusters around and between the claws of sheep where it has been responsible for a low grade lameness, and has also been taken on steenbuck. It has not been shown to be associated with the transmission of disease.

The Tropical Dog Tick.

This tick (*Rhipicephalus sanguineus*, Latreille), Fig. 14, also known as the European brown tick, is closely related to the brown tick, from which it may be distinguished by its smaller size and the fact that punctations of irregular size are scattered more or less evenly over the surface of the shield. It is not very common in the Union and is found mainly on dogs kept in kennels. Houses in which dogs are allowed to sleep sometimes become infested with this tick. In the Zoutpansberg district of the Transvaal this species appears to occur fairly commonly on dogs and many species of wild animals in the open, and further northwards, and in East Africa, largely takes the place of *Haemaphysalis leachii* as the common tick occurring on dogs.

Life History.—It is a three-host tick, the females laying 1,400 to 3,400 eggs in crevices in woodwork, etc., or underneath old plaster, whitewash or paper on walls or under stones, etc., in the open. The eggs hatch in from 17 to 19 days and the larvae engorge in about 4 days. The moult to the nymphal stage occupies from 5 to 8 days and nymphs remain on their host for 4 to 5 days after which they moult to adults in about 12 days. The females remain on their hosts for 7 to 21 days and the males generally longer.

Relation to Disease.—This tick is capable of transmitting biliary fever to dogs caused by *Piroplasma canis*, the infection being acquired in one stage and passed on by the next or, the infection, acquired by the females, may be passed on by the larvae of the ensuing generation. Although this tick is by no means common on cattle it has been shown to be able to transmit gallsickness (*Anaplasma marginale*), the infection being taken up by the larvae and transmitted by the nymphs. In North Africa this species has been shown to be able to transmit rickettsiosis of dogs, a highly fatal disease caused by *Rickettsia canis*. As this disease has been recorded in dogs in the Transvaal, particularly in the eastern lowveld, care should be exercised in introducing sick animals from those areas into areas where this tick occurs. In addition, the protozoon parasite *Hepatozoon canis*, which is responsible for a mild anaemia and slight fever in dogs, has been shown to be transmitted by this species of tick, the infection being acquired in the larval or nymphal stage and transmitted in the ensuing stage but not passing through the egg stage to the following generation. This tick has been shown to be associated with the transmission of tick-bite fever to man and is particularly dangerous in this respect, as houses in which dogs sleep may become infested by it.

The Bont Tick.

This tick (*Amblyomma hebraeum*, Koch), Figs. 15 and 16, together with the other members of the genus *Amblyomma* are among the most striking members of the family *Ixodidae* in South Africa due to the bright coloration of the shields of both males and females.

Description.—The bont tick males and females have a scutum of

which the ground colour is yellowish with a red or green tinge and which bears conspicuous dark brown or black markings. The legs are banded with yellow, which is particularly evident in the females. The mouth parts are long, eyes are present and flat and the undersurface bears no adanal plates or shields in the male. The festoons at the hind margin of the body of the males are uniformly white or very pale yellow.

Life History.—This is a three-host tick and the engorged female, which is dark slate blue in colour and may reach a length of about ¾ inch, may lay as many as 18,500 eggs. The eggs hatch in from 7 to 10 weeks or longer depending upon temperature and the larvae engorge upon their host for a period of from 4 to 20 days. The nymphs also take from 4 to 20 days to engorge and moult in anything from 18 to 25 days with records of up to 160 days. The females remain on their host for 6 to 25 days and the males may remain attached for periods of up to 8 months.

The larvae may withstand starvation for almost a year, the nymphs for 180 to 250 days and the adults for almost two years.

Distribution.—This tick is typically a species of warm climates and even though accidentally introduced into areas where the winters are severe, invariably dies out. In the Union it occurs in the middle and lowveld areas of the northern, north-western and eastern parts of the Transvaal, throughout Swaziland, Natal (except for the higher-lying western section where the winters are severe), and the coastal areas of the Cape Province as far south as about Port Elizabeth. It occurs on a large variety of animals, practically all our domestic animals being subject to attack, as well as wild species of animals.

Relation to Disease.—The bont tick is the transmitter of heartwater to cattle, sheep and goats, a disease which is often a limiting factor to successful farming in many parts of the Transvaal particularly. The infection is acquired from a reacting animal by the larval or nymphal stage and transmitted by the nymph or adult respectively. An infected nymph may feed on a non-susceptible animal such as a horse or donkey without losing its infection and then pass the infection to a susceptible animal as an adult. The infection does not pass through the egg, so that the adult females engorging themselves on a reacting animal and dropping to lay eggs, constitute no source of danger, as the resulting larvae are not infective.

Larvae of the bont tick have been incriminated in the transmission of tick-bite fever to man, caused by a species of rickettsia not unlike that of the eastern strain of Rocky Mountain Spotted Fever of the U.S.A. In this case the infection presumably passes through the egg.

In addition to its capacity for the transmission of heartwater to cattle, sheep and goats the bont tick inflicts deep-seated and painful wounds owing to the long mouth parts. Such wounds are liable to become infected by bacteria which lead to suppuration and abscess formation, or the eggs of blowflies, particularly *Chrysomyia bezziana*, may be laid in and around them leading to severe infestation by maggots which greatly extend the initial wound and necessitate vigorous intervention to prevent more serious consequences.

Information on Departmental Publications.

Farming in South Africa, the monthly journal of the Department, contains popular as as well as scientific articles on a variety of agricultural topics, useful to both the farmer and the housewife, while the Crops and Markets Section supplies information on crop prospects, market prices and exports of agricultural produce.

The following particulars in regard to subscriptions and advertisements should be noted :—

Subscription.—Within the Union, South West Africa, Bechuanaland Protectorate, Southern Rhodesia, Swaziland, Basutoland, Mocambique, Angola, Belgian Congo, and British Territories in Africa, 5s. (otherwise 7s. 6d.) per annum, post free, payable in advance.

Applications, with subscriptions, to be sent to the Government Printer, Bosman Street, Pretoria.

Advertisements.—The Tariff for Classified Advertisements is: 2d. (two pence) a word with a minimum of 5s. per advertisement (prepaid). Repeats, not entailing any change in the wording, will be published at half the cost of the original.

Conditions:

(1) The advertisement will be classified under specific headings, and only one black letter (initial letter) is permitted.

(2) Advertisements in which prices are mentioned must contain the name and address of the advertiser. A nom-de-plume or box number only is not sufficient, and unless this condition is strictly observed, advertisements will not be accepted.

(3) Advertisements will be classified strictly in accordance with the subject-matter of the announcement, determined by the first item mentioned and cannot be inserted under irrelevant headings.

(4) Displayed, classified advertisements will also be accepted. The charge, however, will be 10s. per inch, single column, per insertion, without reduction for repeats.

Copy for Advertisements to be in the hands of the Government Printer, Pretoria, not later than the 20th of the month preceding publication.

Send all advertisements direct to the Government Printer, or write to him for details as to tariff for advertisements.

Popular Bulletins.—Bulletins on various agricultural topics are published by the Department to meet public demand. A list of available bulletins giving particulars of cost, etc., is obtainable free of charge from the Editor, Department of Agriculture, Pretoria.

Scientific Publications.—From time to time the different Divisions of the Department issue science bulletins incorporating the results of research work conducted by them. Other scientific publications issued are: "The Onderstepoort Journal", "Memoirs of the Botanical Survey of South Africa", "Bothalia", "Entomological Memoirs" and the "Annual Reports of the Low Temperature Research Institute". Information in regard to these publications is obtainable from the Editor, Department of Agriculture, Pretoria.

Press Service.—The Press of South Africa is now supplied with a bulletin of agricultural information for their exclusive use. This information is supplied to all newspapers and other journals throughout the country.

Farmer's Radio Service.—In addition to the printed information supplied by the Department to members of the farming community, the Department, in collaboration with the South African Broadcasting Corporation, also has a national broadcasting service for farmers. Information in regard to times of broadcasting is contained in the programmes issued by the Broadcasting Corporation.

Inquiries.—All general inquiries in regard to the above should be addressed to the Editor, Department of Agriculture, Pretoria.

D. J. SEYMORE, Editor.

Crops and Markets

A Statistical and Economic Review of South African Agriculture

by

The Division of Economics and Markets

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CONTENTS

Price Review for January 1947.*

Fruit.—A larger selection of deciduous fruits reached the markets. Consignments of apples, peaches, plums, grapes and apricots were, however, barely moderate and were in strong demand. The maximum wholesale and retail prices at which pears, grapes and plums could be sold in the controlled areas, were fixed during the month. Water-melons and sweet melons were plentiful, especially on the Johannesburg and Port Elizabeth markets, and prices eased considerably. Good supplies of mangoes, papaws and pineapples were on offer. Granadilla and avocado arrivals were, however, limited, and high prices were realized.

Tomatoes.—The markets were well supplied with tomatoes and prices were relatively low, mainly in consequence of the high percentage of poor quality.

Onions.—Larger consignments reaching the markets brought about further price reductions. On the Johannesburg market the prices of Transvaal onions declined from 16s. 8d. to 14s. 9d. per bag; those of Cape onions on the Cape Town market from 12s. 4d. to 11s. 5d. per bag; and those of local onions on the Durban market from 19s. 8d. to 15s. 6d.

Potatoes.—Potatoes appeared in still greater quantities and prices showed a further decline. For example, on the Johannesburg market, the prices of Transvaal potatoes, grade I, fell from 18s. 11d. to 12s. 4d. per bag; those of Natal potatoes on the Durban market from 26s. 6d. to 15s. 1d. per bag; and those of Cape potatoes on the Cape Town market from 19s. 4d. to 15s. 6d. per bag.

Vegetables.—The Johannesburg and Pretoria markets were well supplied, especially with pumpkins, Hubbard squashes, green beans, green peas, beetroot and carrots. On most of the other markets vegetable offerings were, however, too small to meet the particularly good demand, and prices throughout remained high.

* All prices mentioned are averages.

Seeds, Grain and Fodder.—Teff hay of good quality was scarce, while forage was virtually unobtainable. Large quantities of lucerne hay were on sale and the demand steadily weakened.

Eggs and Poultry.—Eggs were fairly plentiful on the Johannesburg market yet relatively scarce on the other markets, and prices were generally high. Further increases in the maximum wholesale and retail prices of eggs were announced at the beginning of February.

Index of Prices of Field Crops and Pastoral Products.

The above index which appears elsewhere in this issue, increased from 200 for the previous month to 202 in January 1947.

The most important changes occurred in the following groups.

(*a*) " Other Field Crops ", i.e. potatoes, onions, sweet potatoes and dry beans, decreased from 236 to 174 as a result of a further price decrease in the case of potatoes.

(*b*) " Pastoral Products " increased from 168 to 178 as a result of a small increase in the average wool prices.

(*c*) " Slaughter Stock " decreased from 208 to 200 as a result of the reduction in the seasonal price of slaughter cattle in controlled areas.

(*d*) " Poultry and Poultry Products " increased from 201 to 237 in January, due particularly to a further increase in the prices of eggs.

Agricultural Conditions in the Union during January, 1947.

Weather Conditions.—Good rains occurred in many parts of the summer-rainfall areas, but the rains occurred as heavy showers and were accompanied by hail which caused damage to summer cereal crops in certain parts. In many areas the withering heat scorched everything and light soaking rains were required to bring relief in these areas. In the southwestern coastal areas in particular, severe drought conditions prevailed.

Crops.—Young summer cereal crops were still very promising, but in most cases urgently needed rain, particularly in the western Transvaal and Northwestern Orange Free State. Timely showers later in the season will ensure that a good maize crop is harvested.

Stock and Pastures.—The condition of stock was generally fair. In the Karoo, however, farmers have already suffered stock losses as a result of the poor pastures, and some have had to trek with their stock to areas with better grazing.

Review of the Wool Market during January 1947.

DURING January 1947 a total of 95,373 bales of wool was offered for sale in Union ports, of which 74,589 bales (78 per cent.) were sold.

Competition was keen for wool of good quality, particularly spinning wool which was offered in limited quantities. The average prices were in most cases somewhat higher than those of the previous month.

Mealie Control Measures.

The permit requirements in regard to the acquisition and disposal of mealies and mealie products in the Union were withdrawn as from 7 February 1947 (See *Government Gazette Extraordinary* of 7 February, 1947). The other regulations, however, relating to the control over mealies still remain in force. Producers may sell only to the Board or its agents, while the restriction on the consumption of pure white mealie products still remains in force..

The Deciduous Fruit Estimates: January 1947.

Except for a few light showers, drought conditions prevailed in the western Cape Province and began to assume serious proportions. The position was also aggravated by withering winds which frequently occurred.

Crop Prospects.

Peaches.—Practically all free-stone peaches have already been harvested. As regards cling-stone varieties, it appeared that in all parts Elberta yields would be fair. Tuscan Cling, the earliest commercial cling-stone, was, however, generally disappointing.

Japanese Plums.—Mid-season varieties, particularly Gaviota, were moderate, while late plums were generally satisfactory.

Prunes.—Yields were heavy, but owing to the shortage of irrigation water in certain areas the fruit will be smaller than was originally expected.

Pears.—Taken on the whole, the present season appears to be one of the best for pears. It seems that only one variety, viz. Josephine de Malines, is giving disappointing yields this year, but as this variety is cultivated on only a comparatively small scale, little difference will be made to the overall crop.

Apples.—Good average crops are expected. In the Koo area the apples will be probably on the small side owing to the drought conditions.

Grapes.—Until the end of January it did not appear that the drought conditions had had any marked effect on the table grape crop. In the Hex River Valley the water supply, including borehole water, began to decrease rapidly. Unless heavy rains fall in time it is feared that late varieties such as Barlinka will not ripen normally and that berry formation will be poor. Waltham Cross is exceptionally good everywhere as regards quality and quantity. On the other hand, Black Prince is poor, and in most areas Hanepoot as well.

The *raisin* and *wine outputs* will undoubtedly be seriously affected by the drought. In the Worcester district a decrease of approximately 25 per cent. as compared with last year's output is expected, while those parts of Robertson which do not fall under the Brandvlei canal, will only have half a crop this year. The same applies to Montagu.

Pests.—The codling-moth position remains satisfactory in consequence of a season relatively unfavourable for the moth and the improved control methods carried out by farmers. Estimates in large commercial orchards in Groot Drakenstein, Ceres and Elgin indicate that the moth infection for Bon Chretien pears is under 5 per cent. this year. Even for the late pear and apple varieties the final infection is expected to be light. In the Hex River Valley mealy bugs in vineyards again appear to be more serious than usual.

(Particulars furnished by the Western Province Fruit Research Station.)

Marketing.

As from 27 January 1947 the maximum wholesale and retail prices at which pears, grapes and plums may be sold in uncontrolled areas have been fixed.

(For particulars see *Government Gazette Extraordinary* of 24 January 1947).

Argentine Deciduous Fruit Export.

According to the most recent figures available, the Argentine export of deciduous fruits increased by 54 per cent. over the 1945 season, viz., from approximately 37,680 tons to 58,230 tons. The increase was chiefly in the case of apples, viz., from approximately 17,480 tons to 26,360 tons; pears from 15,590 tons to 26,180 tons; and grapes from 3,350 tons to 4,200 tons.

The table below shows the most important countries of destination and the total quantity exported to each:—

	1945 JAN.-OCT. (*short tons*)	1946 JAN.-OCT. (*short tons*)
Brazil	28,160	33,850
U.S.A.	7,500	8,000
Sweden	—	14,320
Switzerland	—	950
Other countries	2,020	1,110
TOTAL	37,680	58,230

A noteworthy feature is the increase in the export to the two European countries Sweden and Switzerland.

Maximum Prices of Eggs.

THE maximum wholesale and retail prices of eggs in controlled areas, as fixed on 20 December 1946 *See Crops and Markets* of February 1947, have been increased by 4d. and 5d. per dozen respectively for each grade. These prices have been increased all round by a further 4d. per dozen for each grade as from 7 February 1947. Prices are now as follows:—

	Maximum Price per Dozen. Wholesale.	Retail.
	s. d.	s. d.
Grade I—		
(*a*) Extra Large	3 7	3 11
(*b*) Large	3 5	3 9
(*c*) Medium	3 3	3 7
(*d*) Small	3 1	3 5
Grade II—		
(*a*) Large	3 3	3 7
(*b*) Medium	3 1	3 5
(*c*) Small	2 11	3 3
Grade III—		
Mixed	3 0	3 0

The maximum price at which eggs may be sold in uncontrolled areas has been fixed at 3s. 5d. per dozen. *See Government Gazette Extraordinary of 7 February* 1947.

The maximum wholesale and retail prices of chilled eggs in the Union, as fixed on 22 February 1946, were discontinued as from 15 November 1946, but have again been fixed as follows as from 17 January 1947:—

	Maximum Price per Dozen.	
	Wholesale.	Retail.
	s. d.	s. d.
Grade I—		
(*a*) Extra Large	2 6	2 9
(*b*) Large	2 4	2 7
(*c*) Medium	2 2	2 5
(*d*) Small	2 0	2 3
Grade II—		
(*a*) Large	2 2	2 5
(*b*) Medium	2 0	2 3
(*c*) Small	1 10	2 1
Grade III—		
Mixed	1 11	1 11

(See *Government Gazette Extraordinary* of 17th January, 1947.)

Review of the 1945-46 Cotton Crop.

(Compiled by the Office of Cotton Grading, P.O. Box 956, Durban).

CLIMATIC conditions during the normal planting time were most unfavourable. There was a severe drought during the early part of the season, followed by rains throughout January and February. The yield per acre was thus much below the average.

The prospects for the coming season are much more favourable owing to good rains and a larger acreage being planted. As per ginners' returns the total crop for 1945-46 amounted to 136,115 lb. lint or 274 running bales.

Compared with those of previous seasons, the details are as follows:—

	1945–46.	1944–45.	1943–44.	1942–43.	1941–42.
Running bales	274	293	525	472	710
Statistical bales (500 lb.)	272	270	530	467	683
Lint (lb.)	136,115	135,087	264,989	233,439	341,413
Seed cotton (lb.)	406,969	405,790	768,035	699,334	1,067,105
Seed [delinted and undelinted (lb.)]	258,646	230,154	429,142	425,295	672,348
Linters (lb.)	23,604	22,598	40,515	31,948	62,631

Production in different areas, with the last two seasons' figures for comparison, is as follows:—

	Seed Cotton (lb.)		
	1945–46.	1944–45.	1943–44.
Natal and Zululand	—	36,149	129,144
Rustenburg area (including Pretoria and Marico)	1,624	12,947	5,633
Northern Transvaal (including Waterberg, Pietersburg and Zoutpansberg)	—	—	20,992
Eastern Transvaal (including Middelburg, Lydenburg and Barberton)	395,285	354,762	599,825
Cape Province	—	1,932	12,441
Swaziland	6,450	—	—

GRADING.

Comparison of Staple.	1945–46.		1944–45.		1943–44.		1942–43.	
	Bales.	Per cent.	Bales.	Per cent.	Bales.	Per cent.	Bales.	Per cent
$1\frac{1}{4}$ inch and above	—	—	3	1·02	—	—	23	4·87
$1^{3}/_{16}$ inch	—	—	—	—	2	0·38	—	—
Full $1\frac{1}{8}$ inch	6	2·19	—	—	—	—	13	2·75
Good $1\frac{1}{8}$ inch	195	71·17	277	94·54	476	90·67	337	71·40
$1\frac{1}{8}$ inch	73	26·64	13	4·44	47	8·95	99	20·98
$1^{1}/_{16}$ inch and below	—	—	—	—	—	—	—	—
TOTAL	274	100	293	100	525	100	472	100

Comparison of Grades of Good Colour Cotton.	1945–46.		1944–45.		1943–44.		1942–43.	
	Bales.	Per cent.	Bales.	Per cent.	Bales.	Per cent.	Bales.	Per cent.
Middling fair	—	—	—	—	—	—	—	—
Strict good middling	46	16·79	90	30·72	8	1·52	42	8·90
Good middling	116	42·34	91	31·06	191	36·39	80	16·95
Strict middling	96	35·04	89	30·37	240	45·71	119	25·21
Middling	7	2·55	10	3·41	35	6·67	36	7·63
Strict low middling	—	—	—	—	—	—	—	—
Good colour	265	96·72	280	95·56	474	90·29	277	58·69
Fair colour	—	—	—	—	—	—	—	—
Very light spotted	9	3·28	1	·34	42	8·00	106	22·46
Other off-colour	—	—	12	4·10	9	1·71	89	18·85
TOTAL	274	100	293	100	525	100	472	100

Index of Prices of Field Crops and Animal Products.

(Basic period 1936-37 to 1938-39 = 100.)

SEASON (1 July to 30 June).	Summer cereals. (a)	Winter cereals. (b)	Hay. (c)	Other field crops. (d)	Pastoral products. (e)	Dairy products. (f)	Slaughter stock. (g)	Poultry and poultry products. (h)	Combined index.
WEIGHTS.	19	13	2	3	34	6	17	6	100
1938-39.......	92	109	96	89	79	102	106	94	93
1939-40.......	86	114	77	95	115	105	106	89	104
1940-41.......	108	120	106	156	102	108	110	103	109
1941-42.......	120	144	143	203	102	131	135	136	124
1942-43.......	160	157	144	159	122	147	168	167	147
1943-44.......	170	186	137	212	122	154	185	188	159
1944-45.......	183	186	160	281	122	177	179	184	164
1945-46.......	201	194	164	312	118	198	185	170	170
1946—									
January.......	198	194	191	347	118	204	188	204	174
February......	198	194	158	305	118	186	184	224	171
March.........	198	194	160	280	118	186	181	241	171
April..........	198	194	176	298	118	186	180	270	174
May...........	249	194	170	284	119	186	177	289	184
June..........	246	194	178	287	119	218	178	260	184
July...........	245	194	182	303	120	231	183	193	182
August........	242	194	181	319	120	231	188	164	181
September.....	243	194	183	351	163	231	196	156	198
October........	240	194	166	365	171	231	204	155	201
November.....	240	210	165	309	179	194	208	171	204
December......	242	210	157	236	168	194	208	201	200
1947—									
January.......	242	210	156	174	178	194	200	237	202

(a) Maize and kaffircorn.
(b) Wheat, oats and rye.
(c) Lucerne and teff hay.
(d) Potatoes, sweet potatoes, onions and dried beans.
(e) Wool, mohair, hides and skins.
(f) Butterfat, cheese milk and condensing milk.
(g) Cattle, sheep and pigs.
(h) Fowls, turkeys and eggs.

Index of Prices Paid for Farming Requisites.

Year and Month.	Implements. (a)	Fertilizers. (b)	Fuel. (c)	Bags. (d)	Feeds. (e)	Fencing Material. (f)	Dips and Sprays. (g)	Building Material. (h)
Basis—								
1936–38...	100	100	100	100	100	100	100	100
1942......	123	157	140	206	136	229	117	168
1943......	144	171	154	237	152	239	127	179
1944......	161	184	156	307	155	240	134	184
1945—								
January...	159	204	156	310	162	225	136	181
April......	159	204	156	311	163	224	136	181
July.......	159	204	156	321	169	225	135	180
October....	159	204	146	321	166	225	135	179
1946—								
January...	155	204	146	314	168	218	135	174
April......	152	204	146	304	163	213	134	174
July.......	152	199	130	308	167	214	134	176
October....	153	199	131	319	163	215	134	177
1947—								
January...	157	199	131	322	167	216	134	181

The following is the composition of the above groups. (The items are weighted according to their respective importance) :—

(a) Ploughs, planters, seed-drills, harrows, cultivators, ridgers, mowers, binders, hay rakes, silage cutters, hammer mills, separators, windmills, shares, land sides, mouldboards, mowers, knives, pitmans, guards.
(b) Superphosphate, ammonium sulphate, muriate of potash.
(c) Petrol, power paraffin, crude oil, grease, lubricating oil.
(d) Woolpacks, grain bags, sail twine, binder twine.
(e) Mealies, oats, lucerne, groudnut oil-cake meal, bonemeal, salt.
(f) Fencing wire, standards, baling wire.
(g) Bordeaux mixture, lime sulphur, arsenate of lead, cyanogas, Cooper's sheep dip, Little's dip, Tixol cattle dip.
(h) Corrugated iron, deals, cement, lime, flooring boards.
(j) Preliminary.

Average Prices of Green Beans, Green Peas and Carrots on Municipal Markets.

Season (1 July to 30 June.)	Green Beans (Pocket 20 lb.). Johannesburg.	Green Beans Cape Town.	Green Beans Durban.	Green Peas (Pocket 20 lb.). Johannesburg.	Green Peas Cape Town.	Green Peas Durban.	Carrots (Bag). (a). Johannesburg.	Carrots Cape Town.	Carrots Durban
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	1 8	2 3	2 0	2 4	1 9	1 2	3 8	2 6	6 1
1940–41	1 11	2 9	1 5	2 8	2 4	2 3	5 9	4 11	13 4
1941–42	2 7	3 10	2 6	3 11	3 3	3 4	8 5	8 11	17 2
1942–43	3 1	4 3	3 0	3 3	2 10	3 9	5 1	8 9	13 2
1943–44	3 8	4 11	3 0	4 11	4 10	4 11	9 11	11 1	20 2
1944–45	3 7	5 1	4 1	4 9	4 1	5 5	8 3	9 11	19 10
1945–46	3 4	4 7	3 6	5 11	7 2	6 1	8 10	11 4	17 1
1945—									
January	1 10	0 11	2 4	4 3	1 9	6 7	7 7	3 1	10 2
February	1 7	3 4	2 3	5 5	6 9	7 4	7 8	6 11	19 1
March	2 3	4 11	2 6	7 7	12 0	6 7	9 5	6 3	25 4
April	1 11	2 8	1 10	4 4	6 6	4 0	8 6	13 9	19 6
May	3 3	5 3	2 3	5 9	9 11	3 1	9 5	8 7	21 6
June	4 3	4 2	5 0	4 9	7 9	3 8	10 0	10 10	13 9
July	9 10	7 10	5 10	8 2	11 7	8 8	10 1	16 4	20 11
August	7 4	6 4	6 10	5 8	7 10	5 5	13 4	17 11	12 11
September	3 1	5 9	4 1	2 8	4 1	2 4	7 5	12 8	16 8
October	3 8	5 4	4 9	4 4	3 6	7 7	9 6	9 10	20 11
November	1 6	3 4	2 4	9 0	4 0	9 4	9 8	8 8	16 4
December	2 4	2 3	2 8	12 1	—	12 5	10 9	7 10	13 10
1946—									
January	3 4	1 11	5 6	8 8	10 11	14 7	9 8	6 2	16 0
February	1 11	—	2 3	6 5	—	6 4	7 3	7 11	14 1
March	2 10	1 1	2 5	6 1	—	3 4	8 10	8 1	23 10
April	2 7	3 4	3 1	5 7	—	4 10	10 2	9 3	24 2
May	1 9	3 0	2 2	7 2	3 10	5 10	7 1	6 3	18 8
June	1 10	2 0	2 8	4 8	4 1	5 7	4 2	7 6	11 7
July	3 2	1 11	2 2	2 7	3 6	3 4	3 8	4 8	7 10
August	6 3	4 2	6 6	5 10	5 0	4 9	4 5	3 8	11 0
September	6 6	7 5	6 4	5 0	4 11	5 1	3 8	3 2	10 11
October	5 0	5 0	5 2	3 3	3 6	5 7	4 7	4 1	9 7
November	2 11	2 7	1 11	6 5	3 10	9 5	6 3	3 7	11 5
December	3 9	2 8	2 5	9 0	—	7 0	7 6	5 4	19 5
1947—									
January	3 0	—	3 5	4 0	8 7	4 9	7 7	—	16 5

(a) Weights of bags vary, but on the average are approximately as follows:—Johannesburg, 130 lb.; Cape Town, 90 lb.; and Durban, 120 lb.

Average Prices of Lucerne, Teff, Kaffircorn and Dry Beans.

Season and Month (b).	Lucerne (per 100 lb.). Johannesburg (a). Cape.	Lucerne Johannesburg (a). Transvaal.	Lucerne Cape Town 1st grade.	Teff Johannesburg (a) 100 lb.	Kaffircorn in bags (200 lb.). F.o.r. producers' stations. K1.	Kaffircorn K2.	Dry Beans (200 lb.) bags. Johannesburg (a). Speckled Sugar.	Dry Beans Cow-peas.	Dry Beans Kidney.
	s. d.	s. d.	s. d.	s. d.	s. d.	s d.	s. d.	s d.	s. d.
1938–39	3 10	3 1	4 0	2 7	13 1	12 9	25 0	16 9	24 2
1939–40	3 0	2 5	3 4	2 6	8 8	9 4	21 11	13 11	21 2
1940–41	4 2	3 5	4 3	3 3	15 6	17 0	30 0	16 8	27 11
1941–42	5 7	5 2	5 8	4 7	18 10	19 6	32 10	19 8	28 3
1942–43	5 5	6 0	7 4	5 5	24 10	24 10	34 0	25 8	24 2
1943–44	5 4	5 6	7 3	4 5	21 0	21 7	49 6	29 11	32 1
1944–45	6 4	5 4	7 2	4 9	18 8	18 8	88 7	39 6	70 6
1946—									
January	7 6	—	8 1	5 9	20 6	20 6	103 4	68 6	75 4
February	6 0	5 10	8 1	5 9	20 6	20 6	90 8	69 3	69 4
March	6 2	5 3	7 4	5 4	20 6	20 6	86 8	61 11	63 7
April	7 0	5 6	7 4	4 11	20 6	20 6	91 4	51 0	74 3
May	6 10	5 1	7 6	4 6	69 11	69 11	90 6	52 11	75 7
June	7 3	5 6	7 6	4 5	60 8	60 8	84 2	45 9	66 1
July	7 5	6 9	7 3	4 5	57 10	57 10	81 8	45 1	67 7
August	7 5	4 8	7 3	4 3	48 5	48 5	69 11	41 1	61 7
September	7 6	7 0	7 3	4 4	50 0	50 0	73 0	40 4	61 11
October	6 9	4 11	6 9	4 1	40 3	40 3	69 2	34 5	56 6
November	6 9	5 10	—	3 11	40 10	40 10	61 4	35 3	59 10
December	6 3	5 6	7 3	4 5	48 8	48 8	70 2	36 6	52 11
1947—									
January	5 10	5 11	—	3 8	48 9	48 9	61 4	38 11	51 4

(a) Municipal Market.
(b) Seasonal year for kaffircorn, 1 June–31 May. Dry Beans, 1 April–31 March; Lucerne and teff, 1 July–30 June.

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CONTENTS

[NOTE.—Articles from *Farming in South Africa* may be published provided acknowledgment of source is given.]

G.P.-S.13141—1946-7—7,750.

Native Schools on European Farms.

ONE of the reasons for the migration of natives from European farms is probably the natural desire of native parents to live within easy reach of schooling facilities for their children.

Farmers who have established Native Schools on their land have usually found that this has resulted in a more stable and contented labour supply.

The following regulations have recently been promulgated:—

" For the establishment of primary schools on European farms, grants not exceeding £150 per school may be paid to assist in their erection and equipment, subject to the following conditions:

(i) that the applicant or applicants enter into a bond to carry on the school to the satisfaction of the Director of Education for ten years from the date on which the grant is made, and, in the event of the school being closed before the expiry of this period to repay to the Provincial Administration 10 per cent. of the amount of the original building and equipment grant for each unexpired year or part of a year of the agreed ten years—the amount thus surrendered may be wholly or in part paid in school furniture, the valuation of which shall be decided by the Provincial Administration;

(ii) that the building be erected of material, and according to a plan, approved by the Director of Education, and that it be completed to his satisfaction before the grant is made, provided that the Administrator may, under special circumstances, modify this condition by authorising payments of the grant in instalments while the building is in progress;

(iii) that the farmer shall include in the bond: (*a*) ground of suitable type and size for a school garden;

(*b*) suitable accommodation and gardening ground for the teachers;

(iv) that the building shall be used only for school purposes and for purposes related to the school.

The Education Department will pay teachers' salaries according to existing scales.

Farmers wishing to take advantage of this offer, should make application with as little delay as possible to :—

The Chief Inspector of Native Education,
Box 380,
PIETERMARITZBURG.

Each applicant is asked to state clearly:—

(*a*) his name and address;

(*b*) his magisterial district;

(*c*) the estimated number of Native children who will attend the school;

(*d*) the approximate distance between his farm and the nearest existing Native School.

FARMING IN SOUTH AFRICA

Vol. 22 APRIL 1947 No. 253

Editorial:

Wheat Growing.

THE prevailing high price for wheat in South Africa is frequently the subject of criticism by consumers, and arguments have been advanced for the removal of the protective tariff on imported wheat, and even for the abandonment of wheat growing in this country.

Taking the long view, however, the wheat commission of 1939 recommended that South Africa should be self-sufficient as regards wheat to a certain extent, and this recommendation was justified during the war years. During this critical period, with an abnormally large population and increased demand for bread, South African farmers produced not all, but a great part, of the wheat that was required, and, although at times the bread position appeared to be critical, South Africa never had to do without bread.

In the course of the war the price of wheat rose, as various articles required for its production became scarce and more expensive. Less fertilizer was available; the labour supply was reduced; and tractors and machinery wore out, but had to be kept going by constant repair, as very few replacements were available. But throughout this period it was the policy of the Department of Agriculture, and also of the Wheat Control Board, to maintain wheat prices at an economically sound level and to prevent them from soaring to such levels as would induce inflation of land values.

Each year the estimated costs of production per bag of wheat are carefully worked out, being based on the production costs of the south-western Cape Province—the main and most stable producing area of the country. To this figure is added a reasonable sum to cover interest on land and operator's earnings, and the total is the figure at which the price of wheat is set. Last year, at a time of acute world wheat shortage and a lack of wheat reserves in this country, it was deemed wise to encourage wheat growers to exert a maximum effort to produce wheat by offering an additional inducement in the wheat price. At no time, however, has the price been such as to permit of great profits for the farmer, and the price of bread has been kept at a low figure for the consumers by means of a Government subsidy.

But now, at the end of the war, the price of wheat is still high, and all parties concerned—the Government, the Department of Agriculture, the consumer and the producer—want to see it reduced to a more healthy level.

This reduction can be brought about in two ways, namely, by reducing the cost of production, and by increasing the yield per morgen.

The chief factors which contribute to the production costs are labour, traction and machinery, fertilizers, seed and bags.

For various reasons the supply of farm labour has diminished, in consequence of which farm wages have risen, and at the same time the efficiency of the labour has weakened. One direct result of the labour position is that wheat farmers have been forced to mechanize their farms to a large extent. The prices of tractors and the various machines and implements required on a wheat farm have soared, partly because of increased costs in their manufacture, and partly because of scarcity due to limited shipping accommodation. Fertilizers have been in short supply largely due to the lack of shipping space, and are expensive. The cost factor of seed is dependent upon the price of commercial wheat and has risen in price as the market price of wheat was raised. The bag position has never been easy and prices have risen. Now the position is exceedingly difficult and future prices are uncertain but will undoubtedly be high.

From this review of the cost factors in wheat production it is evident that there is uncertainty in future trends for certain items such as labour and bags, but that for other important items a reduction in cost is to be expected as world trade returns to normality, and shipping facilities become easier. The peak period of production costs has probably been reached, and from now on a gradual reduction in costs is to be expected, and with this a readjustment of prices as the costs decline.

A still more important factor which must be considered in connection with the lowering of wheat prices is that of the yield of wheat per morgen, for, whatever the cost of production per morgen may be, the higher the yield per morgen, the lower can be the price of wheat with the same profit for the farmer. But high yields cannot be obtained by a continuation of the systems which of necessity have had to be followed during the critical past few years in order to ensure sufficient bread.

The time for readjustment has come, and we must direct our efforts to efficient wheat production. This means that in areas which are sub-marginal for wheat, commercial wheat growing must stop. In marginal areas, only the most suitable soils must be sown. The extensive production of wheat under dry-land farming in the summer-rainfall areas which, favoured by Nature in the past few critical years, have stood this country in good stead, must be recognized as an unsound agricultural proposition because of the uncertain moisture conditions. Such a gamble with Nature does not make for efficiency in production, and over a large section of this area the land can be more effectively utilized in the production of wheat or other plants for winter grazing for the livestock.

Under irrigation, wheat growing is a stable proposition as it is not subject to the vagaries of an uncertain rainfall. There wheat growing has a proper place, but for the best results and the highest efficiency the crop must be produced under cropping systems which will maintain the soil's fertility and also ensure high yields.

In the south-western Cape Province where climatic conditions are sufficiently favourable to make this area the main wheat region of the Union, considerable reorganization of the farming systems must be made. On the thin sandy soils of the Sandveld rye must be grown, not wheat. In the main grain areas very shallow soils should not be cultivated as they are seldom economic. Likewise,

 [Continued on page 346.

Does Small-Farm Dairying Pay?

A Milk-Production Unit Experiment at the Vaalhartz Agricultural Research Station.

W. A. Verbeek, Animal Husbandry Research Officer, Vaalhartz.

SINCE 1938 experimental work has been conducted with various classes of farm animals at the Vaalhartz Agricultural Research Station. The aim has been to develop, under irrigation conditions, stock-farming systems capable of being successfully applied on this irrigation scheme in order to ensure a stable income for the settlers. Dairy farming is receiving special attention, and the experiments carried out in this connection have yielded very favourable and encouraging results. On the basis of information collected over a

Cows on Sudan-grass pasture 15 inches high.

number of years in crop and milk-production experiments under intensive irrigation conditions, a full-scale dairy farming project was initiated at this research station in 1943 with 30 Friesland cows and one bull on 24 morgen of irrigation land. This project is called the milk-production unit experiment, and its object is:

(1) To develop an efficient and remunerative system of dairy farming under intensive irrigation conditions, without veld grazing;

(2) to determine what possible income can be expected from this farming system under Vaalhartz conditions; and

(3) to apply the results of research with dairy cows and crops conducted elsewhere at this institution, in actual practice, with a view to the more accurate determination of the problems involved in this form of farming.

The decision to use 24 morgen of land for this experiment is based on the fact that most plots at the Vaalhartz Settlement are 30 morgen in extent. Using 24 morgen for milk-production purposes, leaves a few morgen for the house and other buildings, kraals,

camps, a vegetable garden and fruit trees, as well as space for the cultivation of other crops like wheat, potatoes and feed for draught-animals, i.e. 6 morgen in all. Since veld grazing on this settlement is limited and most settlers have difficulty in obtaining it, no veld grazing is made available to the animals in this unit experiment.

The 24 morgen of irrigation land are used exclusively for the production of fodder and pasture crops for the herd, and a six-year rotational cropping system is followed with lucerne, winter cereals and Sudan grass or babala, details of which are given in the following table.

Rotational Cropping System with 6 camps of 4 morgen each.

Season.	Camp 1.	Camp 2.	Camp 3.	Camp 4.	Camp 5.	Camp 6.
1943—						
Summer........	Lucerne	Summer grass	Lucerne	Lucerne	Lucerne	Summer grass (S).
1944—						
Winter.........	Lucerne	Winter cereal	Winter cereal	Lucerne	Lucerne	Lucerne
Summer........	Lucerne	Summer grass	Summer grass	Lucerne	Lucerne	Lucerne
1945—						
Winter.........	Lucerne	Lucerne	Winter cereal	Winter cereal	Lucerne	Lucerne
Summer........	Lucerne	Lucerne	Summer grass	Summer grass	Lucerne	Lucerne
1946—						
Winter.........	Winter cereal	Lucerne	Lucerne	Winter cereal	Lucerne	Lucerne
Summer........	Summer grass	Lucerne	Lucerne	Summer grass	Lucerne	Lucerne
1947—						
Winter.........	Winter cereal	Lucerne	Lucerne	Lucerne	Winter cereal	Lucerne
Summer........	Summer grass	Lucerne	Lucerne	Lucerne	Summer cereal	Lucerne
1948—						
Winter.........	Lucerne	Lucerne	Lucerne	Lucerne	Winter grass	Winter cereal
Summer........	Lucerne	Lucerne	Lucerne	Lucerne	Summer grass	Summer grass
1949—						
Winter.........	Lucerne	Winter cereal	Lucerne	Lucerne	Lucerne	Winter cereal
Summer........	Lucerne	Summer grass	Lucerne	Lucerne	Lucerne	Summer grass

The winter-cereal grazing consists of oats and barley and the summer grazing of Sudan grass and babala.

The Rotational Cropping System.

The area under lucerne is 16 morgen in extent; 8 morgen are put to oats and barley in winter and to Sudan grass or babala during the summer period. The lucerne remains for four years, at the close of which it is ploughed in and followed for two successive years by winter cereals and Sudan grass or babala during summer, after which the area is again put to lucerne. In a definite rotation, four morgen of lucerne are ploughed up annually, while four morgen which have been under Sudan grass or babala, are sown to lucerne again. The lucerne is established during April, with an application of approximately 20 tons of kraal manure, 1,000 lb. of superphosphate and 200 lb. of sodium nitrate per morgen. It also receives an annual

top-dressing of 800 lb. of superphosphate per morgen during August. The kraal manure is obtained from the cows in the unit proof. The oats and barley are sown during March and April with an application of 600 lb. of superphosphate and 300 lb. of sodium nitrate per morgen, except when the crop succeeds lucerne, in which case only 600 lb. superphosphate per morgen are applied. Algerian oats and Victoria barley are sown. The oats and barley are ploughed in from the beginning of September to the middle of October, according to the decline in growth, and replaced by Sudan grass and babala, sown from the end of September and on into November, 800 lb. of superphosphate and 400 lb. of sodium nitrate per morgen being applied at the time of sowing. The following quantities of seed are used per morgen: Lucerne, 40 lb.; Sudan grass and babala, 60 lb. each; oats and barley, 150 lb. each.

Cows grazing on babala 12 inches high.

The lucerne is cut mainly for hay and fed to the herd in this experiment. The surplus lucerne hay, carried over at the end of each year, is sold. When circumstances do not permit of the making of lucerne hay, the crop is ensiled with 3 per cent. molasses. This lucerne silage is fed during seasons when no summer or winter grazing is available. The lucerne is not grazed, the danger of hoven being too great.

The stubble or residue which is usually wasted on the land after the lucerne has been cut and the hay removed, is, however, grazed for 2 to 3 days after each cutting, when there is no danger of hoven.

The oats, barley, Sudan grass and babala are used exclusively as grazing.

Treatment of Dairy Cows.

Good quality cows are kept in this experiment since the feeds and pastures produced are too valuable and expensive to be fed to animals of inferior quality. Because no veld grazing is available, no calves are reared, and suitable cows or heifers are bought to replace old cows, cows that die, low producers and unproductive cows. Calves born in the herd are sold before they are a week old, as is done in large dairying concerns in and near urban areas. When not

grazing or being milked, the cows are kept in two camps (provided with adequate tree shelter) near the milking shed. Cows in milk are kept apart in one camp, and dry cows in calf and the bull in another. In these camps the cattle receive their lucerne hay and silage in hay-racks with mangers, which reduce wastage to a minimum. Water and a salt-and-bonemeal lick are also provided here. As far as possible, the cows are milked for 300 days and served again about two months after calving. Young cows are served about 3 months after calving, in order to give them more time to improve in condition before the next lactation commences. The cows are milked twice a day and at milking time the high producers receive supplementary mealiemeal feed in the byre. This mealiemeal is bought, no maize being produced under this system as yet. The surplus lucerne hay is virtually exchanged for mealiemeal.

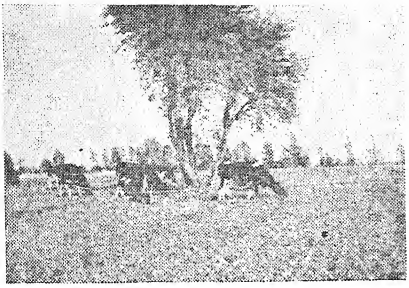
Grazing of Crops.

The oats, barley, Sudan grass and babala are, as far as possible, all grazed in the early stages of growth, i.e. when they have reached the height of 9 to 12 inches. In these stages the nutritive value is at its peak, especially for milk-production, and recovery of the plant much more rapid. These pastures are controlled and the amount supplied to the cows restricted in order to ensure that suitable young grazing will always be available during the season. The area under pastures is divided into morgen camps by means of electrical or other temporary fencing and each camp is cropped down within a period of 7 days, after which it is rested to recover for the next grazing period. Continuous grazing of summer and winter pastures has a most detrimental effect on the growth of plants. Considerably more grazing of higher quality is obtained through this system of rotational grazing.

High-producing cows always receive preference on pastures. Dry cows in calf receive grazing only when the needs of the producing cows have been provided for. Shortly after sowing and again at the end of the season when grazing is still scarce, only the high producers are allowed on the pastures, and only for about an hour per day. As more grazing becomes available, the high-producing cows are kept on grazing for longer periods per day and the other cows in milk and later also the dry, pregnant cows are gradually allowed on pastures. The dry, pregnant cows are usually put on pastures which have first been lightly grazed by the cows in milk; this gives the latter the benefit of the best grazing, the residue being sufficient for the dry pregnant cows. The crops used in this system make valuable pastures, on which cows can maintain a high level of milk-production with the lucerne supplement they receive. It is, consequently, of primary importance for the success of the farming system that the pastures be used as effectively and economically as possible, especially the winter cereals which cannot make such rapid growth as the summer pasture crops.

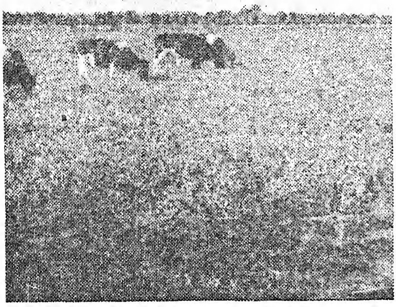
Hay Ration.

Cows in milk are taken to the pastures immediately after milking in the morning, and on returning they are given lucerne hay in the camp racks. The quantity of lucerne hay fed, varies according to the amount of grazing available. When grazing is scarce and the cows are allowed to graze for only one hour per day, they receive an average of 25 to 30 lb. of lucerne hay per cow per day. In the case

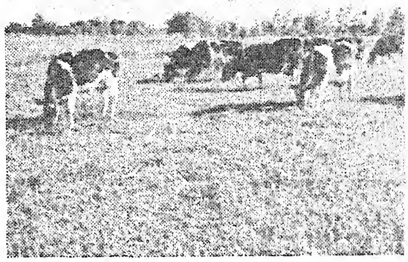


Cows on barley pasture.

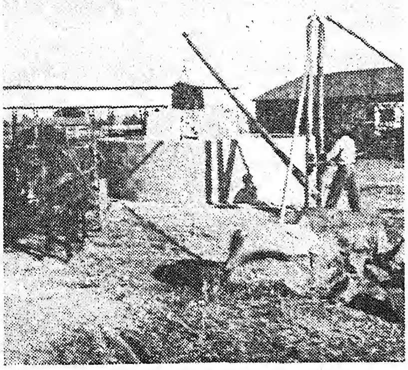
Cows grazing on oats.



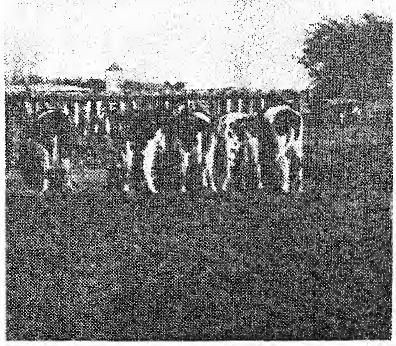
Cows on fine stand of young oats.



Sudan grass in young growth stage being grazed for the fourth time.

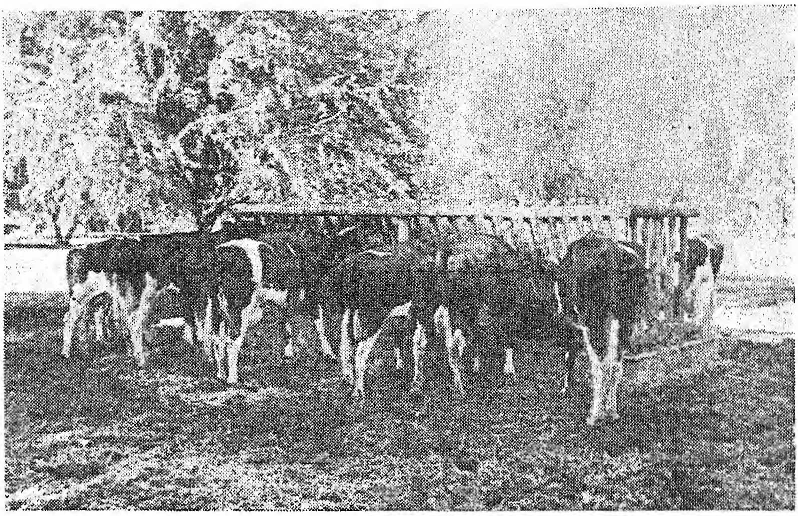


Unchopped lucerne silage being hoisted from the pit silo and loaded on to a wagon.



Bull and dry cows at hayrack.

of cows grazing for 4 hours per day, the average allowance is 18 to 20 lb. lucerne per cow per day. On 8 hours of grazing per day, the cows receive an average of 15 lb. of lucerne hay per cow per day. In addition to lucerne hay, cows yielding 4 gallons of milk per day and more, receive supplementary mealiemeal, according to their excess production. Dry, pregnant cows receive less lucerne hay than the cows in milk, viz. an average of 10 lb. of hay per day when they



Cows in milk at the hayrack.

are on pastures. During the period of transition from winter to summer and again from summer to winter, i.e. from the time when the pastures begin to fail in growth and nutritive value till the next pasture crops are ready for grazing, only lucerne hay or lucerne hay and lucerne silage are provided, if the latter is available. Cows in milk then receive an average of 35 lb. of lucerne hay or 25 to 30 lb. of lucerne hay plus 30 lb. of lucerne silage per cow per day; cows producing more than 3 gallons of milk per day receive a supplementary ration of mealiemeal according to their production. Dry, pregnant cows receive an average of 20 to 25 lb. of lucerne hay per cow per day when they are not on grazing.

Sowing Time for Crops.

The transition period is usually of short duration, since the sowing programme is drawn up with a view to making the interruption of grazing as brief as possible. Sudan grass or babala, which is sown during the last week of September or during October, may be grazed after about 46 days, i.e. from the middle of November onwards. Oats, sown during April—May, will yield grazing till October, thus reducing the break to about 1½ months during which no grazing is available at this time of the year. The period of transition from summer to winter is of about the same duration, since oats sown during March will be ready for grazing from the beginning of May, while Sudan grass or babala yields grazing till the end of March. During 1946, for instance, oats and barley were sown on 8 April, 1946 (after the lucerne had been ploughed in) and then grazed

from 24 and 26 May, 1946, i.e. 47 and 49 days respectively after the date of sowing. The barley was grazed until 30 September after which it was ploughed in, the soil being sown to Sudan grass and babala on 30 September, 1946, these crops in turn being grazed from 14 November, 1946. The oats produced good grazing till 25 October, 1946, when it was ploughed in and succeeded by Sudan grass and babala.

Results Obtained.

This milk-production unit experiment which has been in operation for 3 years, has already produced valuable results and shows that dairy farming can be a paying proposition under intensive irrigation conditions. The results obtained during the second and third years of this experiment, extending from 1 September, 1944, to 31 August, 1946, are briefly given below:—

A.—Milk Production.

	Second Year.	*Third Year.*
Experiment period (365 days)	1/9/44 to 31/8/45	1/9/45 to 31/8/46
Average number of cows in herd during year	29·99	29·8
Average number of cows in milk during year	72·5	72·5
Average number of cows in milk during year	21·7	22·8
Total milk-production	184,303 lb.	200,887 lb.
Average milk-production per day	50·5 lb.	55·0 lb.
Average daily milk-production per cow in herd	16·8 lb.	18·5 lb.
Average daily milk-production per cow in milk	23·0 lb.	24·0 lb.
Number of calves born—		
Heifers	15	14
Bulls	13	13

One cow died during the second year, and three during the third.

B.—Fodder Production.

Average amount of lucerne hay surplus per year	14 tons
Seed and fertilizer used per year:—	
Lucerne seed	180 lb.
Oats and barley seed	1,200 lb.
Sudan grass and babala seed	480 lb.
Superphosphate	124 bags.
Sodium nitrate	22 bags.

The lucerne yield averaged 9 tons per morgen per year. The lucerne receives 8 irrigations per year, and the oats, barley, Sudan grass and babala 4 to 5 per season.

C.—Consumption of Herd (cows and bull).

Lucerne hay	207,460 lb.	243,250 lb.
Lucerne silage	142,730 lb.	67,790 lb.
Concentrates	21,841 lb.	14,341 lb.
Bonemeal and salt	750 lb.	1,030 lb.
Cow grazing days of—		
One hour per day	325	748
Two hours per day	880	2,013
Four hours per day	2,827	4,607
Eight hours per day	2,488	2,164

This experiment is only in its initial stages and it shows improvement as the development of the six-year system of rotational cropping progresses, the quality of the cows improves and the management becomes more efficient. Thus far, increasingly favourable results have been obtained each year, as can be seen from the increased milk-production, the reduced consumption of concentrates and the improved

grazing yields of the third year, as compared with those of the second year of the experiment. The unit experiment can, however, still be improved in many respects. The yield of the lucerne hay is, for instance, very poor and should be considerably higher. A portion of the lucerne is old and has a poor stand, while one morgen is carrying a mixture of lucerne and grasses used in earlier experiments. As soon as the rotational cropping system is in full operation, the yield will improve. The quality of the cows can also be greatly improved, because this unit experiment was commenced with a number of mixed cows, some of which were somewhat indifferent producers.

Further Improvements Proposed.

It is intended to conduct this undertaking as an independent unit in the near future, with its own complete equipment and labour, like agricultural implements, draught animals, native labourers, a European foreman, etc., in order to make the whole farming enterprise correspond to conditions encountered by the farmer. The project, however, remains an experiment and is always subject to adjustments and improvements, as the results of other experiments become available, and more experience is gained.

Since the commencement of the experiment, various improvements have already been effected, e.g. the amount of superphosphate and nitrate applied in the case of winter cereals and Sudan grass and babala has already been increased. Whereas the nitrate was formerly applied as a top-dressing, all of it is now applied at the time of sowing, since it has proved to be a failure as a top-dressing. Where only oats were formerly sown for winter grazing, two morgen are now put to barley, which is valuable as grazing during the cold winter weeks when oats show no growth. The grazing of the residue on lucerne lands after mowing for hay, has prevented waste of valuable fodder and provided plenty of grazing for the cows. Babala is also sown for summer grazing since it has been found to give a slightly higher grazing yield than Sudan grass, and has the same value for dairy cows. The possibility and profitability of rearing a few heifer calves from the best cows each year, is being investigated, since there is often superfluous grazing and surplus feed. Hence, if the rearing of only a few (about 4) heifer calves has to be undertaken each year, this branch may later be incorporated in the undertaking, since cows and heifers of good quality are expensive and difficult to obtain. Furthermore, there is always the danger of introducing disease with bought animals.

Application of this System.

The settler or farmer who wishes to start a dairy-farming concern similar to this milk-production unit experiment, will have to change over *gradually*, since cows of good quality are expensive and difficult to obtain, and suitable buildings are essential. Until such time as the dairy herd can be brought up to full strength, surplus lucerne hay can be sold and the amount of summer and winter grazing reduced accordingly.

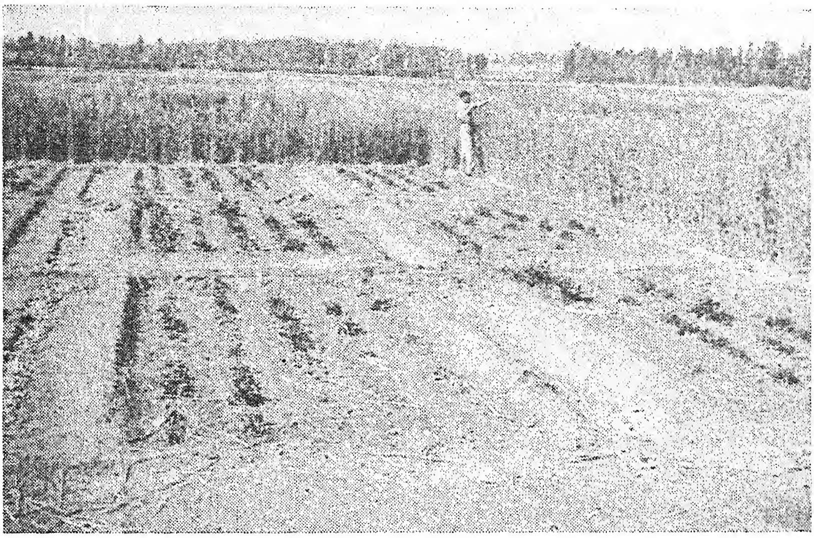
The type of dairy farming aimed at in this milk-production unit experiment, is a very stable form of farming. It is, however, very exacting and only those who are keenly interested in dairy farming and command the necessary knowledge, can expect to make a success of the undertaking.

Rye Windbreaks for Vegetable Plots.

E. Strydom, Horticulturist, Vaalhartz Experiment Station, Division of Horticulture.

IN vegetable-growing areas such as the Cape Flats, parts near Port Elizabeth and at Vaalhartz, where strong winds often occur and the soil is of a sandy nature, it is essential, where vegetables are grown, to make provision for windbreaks.

Wind damage to vegetable crops may occur in different forms, apart from the direct effect of the blowing over and breaking off of plants. Of particular importance in this connection, is the scorching



Rye windbreaks between vegetable plots.

of finer plants such as lettuce, which has an adverse effect, not only on the yield, but also on the quality, as a result of leaf damage. Even more important still, is the problem of establishing the crop on the land. The seedlings of most vegetable varieties are usually so fragile that after germinating they may easily be scorched to death or smothered by sand. Windy weather usually causes the top layer of soil to dry out rapidly, leaving insufficient moisture for the survival of the seedlings. The fine, dry, hot sand is blown around the plants and may ultimately cover them completely. Although various types of windbreaks of straw or reed mats, hedge plants or trees are commonly used, they all have disadvantages as well as advantages. The construction and maintainance of reed-mat hedges, e.g., which would afford complete protection, involve heavy expenses. Beans and hedge plants, again have the disadvantage that their roots take up much valuable ground, may exhaust the soil in their immediate vicinity and have a shading effect.

At Vaalhartz, rye was used very successfully as a windbreak and showed few of the common disadvantages.

Rye Windbreaks at Vaalhartz.

The accompanying photo shows a windbreak consisting of a stand of rye of the Abrussi variety, planted between the vegetable experiment plots in the horticultural section of the Vaalhartz Experiment Station.

This variety was obtained from the Stellenbosch-Elsenburg College of Agriculture and grew very vigorously on the poor, sandy soils at Vaalhartz. The whole piece of land was divided into plots of about 100 ft. by 50 ft. and the rye attained a height of about 5 ft. 9 in., providing an excellent windbreak. Depending on the strength of the wind, the rows may be planted even further apart, since a row of rye takes up about 3 ft. of land on either side by shading and exhausting the soil. Although rye is a winter cereal, it may be used successfully during summer as a protection against the scorching south-east winds. Rye has a strong straw and by preparing the soil in good time for the summer vegetables, the rye windbreaks may be sown during the winter months, even as late as July. By the time the summer vegetables are planted, the rye will already have reached a good height and will afford excellent protection for the young plants. When the rye matures early in summer, the ears may be cut off and the straw left between the vegetable plots to provide a windbreak as long as it is required.

Wheat Growing :—

[*Continued from page* 336.

very steep sloping lands, because of their erodibility, should be retired from cultivation and put down to pasture, and the remaining lands must be farmed under improved systems. Provision must be made for the alternate cultivation of soil-building humus-producing crops such as dry-land lucerne with wheat. A fair start has already been made in this direction, but the system must be extended and applied to every land, so that each land in turn may be benefited by the pasture crops. This will not only ensure a better system of mixed farming—an ideal towards which all must strive—but it will also result in high yields of wheat per morgen at relatively low cost. The final objective can be, and must be, higher yields of wheat per morgen, lower costs per bag, lower prices to the consumer and greater profit for the farmer.

(Prof. J. T. R. Sim, Stellenbosch-Elsenburg College of Agriculture.)

Nursery Quarantines.

The following nursery quarantine was in force on 1 April 1947:—

Municipal Nursery, St. George's Park, Port Elizabeth, on Privets, Bay, Ekebergias and Pecans (all), for red scale.

Pastures of the Southern O.F.S., a Century Ago and To-day.

J. C. de Klerk, College of Agriculture, Glen.

THE passing of the Soil Conservation Act in 1946 was the first step in an extensive and vigorous propaganda campaign aimed at restoring and conserving the natural agricultural resources of South Africa—soil, veld and water. To-day everything possible is being done to draw attention to the deterioration of the veld and the erosion of our lands.

When farmers are asked to give reasons for the deterioration of their stock, they invariably blame the periodic droughts, in other words, the lack of sufficient grazing or water on the farm, and it is for this reason that the State has to-day made it its aim to assist every individual farmer not only to safeguard but also to restore and constantly improve his grazing and water sources against further deterioration.

It would be idle to deny that our South African pastures presented a completely different picture a century ago, and it is, therefore, the object of this article to subject a portion of the pastures of the southern Orange Free State to a close scrutiny in an attempt to ascertain the extent and causes of the changes which have taken place.

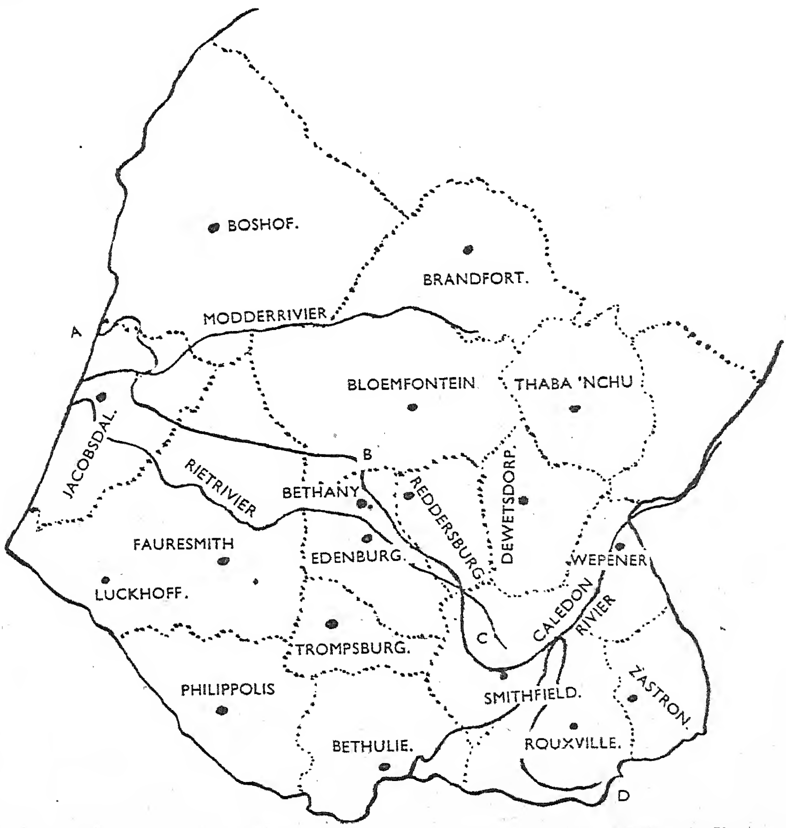


FIG. 1.—Map of southern Orange Free State. Line ABCD indicates the transition stage between grass veld and shrub veld. This transition belt is several miles wide.

Historical Data.

Fortunately we have a considerable amount of information at our disposal in the form of descriptions of conditions in the southern Orange Free State in those days, by travellers like James Backhouse who visited those parts in 1839; Gordon Cummings, a big-game hunter, in 1850; Dr Andrew Smith, director of an exploring party, in 1834; and Zeyher in 1836. In addition to the narratives of these travellers, there is also the testimony of officials and farmers from the Cape Colony who, more than a century ago, visited these parts in times of drought.

In the accompanying map (Fig. 1) the area of transition from grassveld to shrub is indicated by the line ABCD. There is naturally no definite line of demarcation, since one type of veld gradually merges into another. The Riet River area south of Bethany is now regarded as mainly shrub veld, whereas a century ago it was covered with waving grass. The Voortrekker woman, Anna Steenkamp, writes of this area:—" With rejoicing we reached the Riet River. . . We then entered a country, arid and devoid of wood or manure, where the grass grew so tall that we could hardly find the cattle and the children in it "(1). (Translation). Another visitor to this area was W. C. van Ryneveld, Civil Commissioner of Graaff-Reinet, who visited the Trek-farmers there in 1839. He states that along the Riet River , where the trekkers were locatted, the grass was luxuriant, and, " as far as the eye could see, the country looked like a land of wheat " (2). (This description could be applicable only to red grass.)

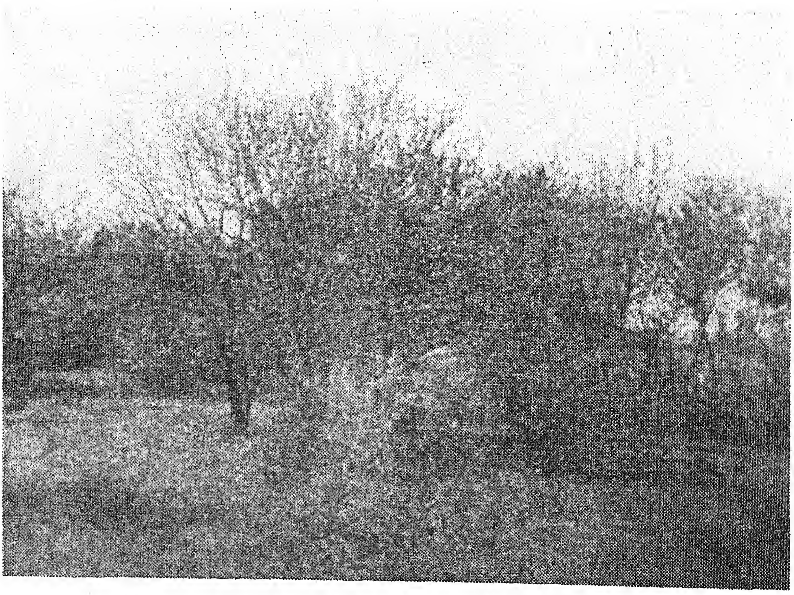


FIG. 2.—Thorn-tree veld such as this formerly occurred on an extensive scale in the south-western O.F.S.

James Backhouse and his party also traversed this area in 1839 on his way back to Philippolis. In his description of the veld in the vicinity of the Bethany Mission Station he says:—" The country continued to be covered with grass, mostly of a ' sour ' character

and it was now brown from the cold." On his way from Bethany to Riet River and Randfontein he met a certain farmer by the name of van Wyk, who was out hunting, and "remarked to him that this was a fine grassy country "(3).

On his hunting expeditions, Gordon Cummings travelled from the confluence of the Orange and Vaal Rivers to a spot which he called "the land of the blesboks, which are found together with black wildebeeste and springbok in countless thousands on the vast green plains of short 'sour' grass situated about 150 miles to the eastward of my then position." Cummings reached the Riet River

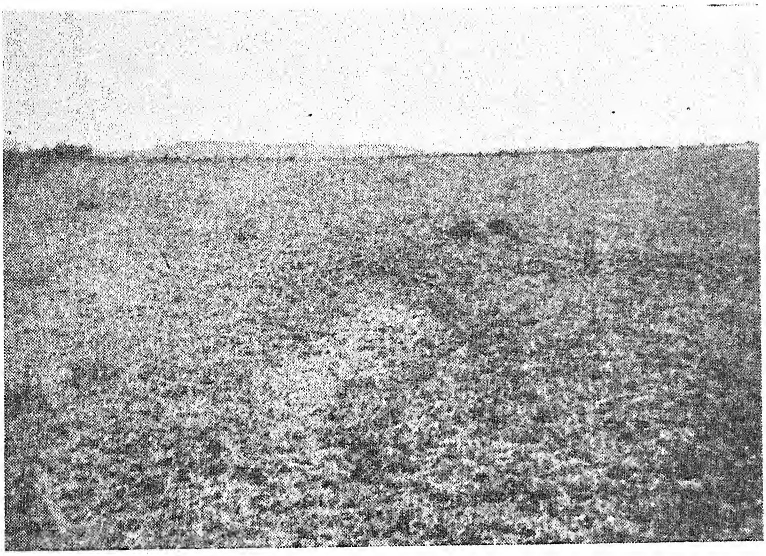


FIG. 3. Densely covered red-grass veld which has been grazed short by cattle during the recent drought. Note the absence of bare patches.

in due course. North of the river he found soft, open sandy veld with occasional hills, luxuriantly covered with grass. From the Riet River he trekked north-east for a short distance to the western borders of a country "entirely different from any I had hitherto seen". "The sweet grass which had heretofore been so abundant", he continues, "became very scarce, being succeeded by a short crisp 'sour' pasturage, which my cattle and horses refused to eat "(4). (This grass was probably "suurpol", *Elyonurus argenteus*.)

On another expedition Cummings also refers to this "sweet grass" south of the Vet River. As he proceeded southwards he found himself "upon the country of sweet grass and entering upon bare and boundless open plains, thinly clad with 'sour' pasturage, the favourite haunt and residence of innumerable herds of black wildebeest, blesbok and springbok." [It must be pointed out here that the climax grass of this region is "wildebeest" grass(5), but since Cummings referred to it as "sweet grass", the only explanation can be that, owing to the vast numbers of antelope grazing on it and the fact that the natives were in the habit of burning the veld, it must have reverted to red grass, which is a transition grass.] If the map (Fig. 1) is now again consulted, it becomes apparent from this and other evidence that the strip of country which to-day constitutes a transition area between grassveld and shrub, was a pure

grassveld area a century ago, probably covered with red grass as the climax grass, and that the line of transition at that time must have been situated much further south. This is borne out by the writings of the above-mentioned and other authors. On his journey between Colesberg and Philippolis, Backhouse states that the country north of tthe river was much like that on the south side, " but the grass was not quite so scarce," and further towards Bethulie he says that " the grass on the adjacent plain was nearly all eaten up " (3).

Dr. Andrew Smith traversed this same area in September 1834 and he observes that: " The old grass stood rather more abundant and the young blades of a dark green colour began to be seen thinly intermixed with the dry ones. The country still consisted of flats and trap hills. Very few shrubs and only on the hills a few thinly scattered dwarf trees " (6).

The Griquas complained to Dr. Smith that the stock of the Trek-farmers from the Colony were eating all their " grass ". He says that at Boschjesspruit " on the flats but especially on the hills there was an abundance of dry grass," while in the vicinity of Slikspruit (near Bethulie) " the flats have scarcely a bush upon them and the grass grows in tufts, closely set together." He adds that " there are two sorts of grass occurring—' sour ' and ' sweet '; the latter is the most abundant and the former appears longer in consequence of being untouched by the cattle " (6).

Even in those days there was veld deterioration, as appears from Dr. Smith's remark that " the sour grass does not get destroyed in the roots so quick as sweet grass—the sweet grass is by the treading of feet killed and is succeeded by small bushes."

A farmer by the name of Kruger, whose farm adjoined the Slikspruit, complained that the stock farmers were not applying any system of veld control and that " if they were to feed their sheep upon the higher and drier parts and let the cattle resort to the moister parts on the farm, the grass would never be destroyed the way it is."

On a subsequent journey from Philippolis to Douglas, Dr Smith remarks that " the country between Philippolis and Bushmanfontein is very dry with a moderate quantity of short grass ", and that as he proceeded to Spoetfontein there was " very little grass except in the valley through which the water flows."

Causes of Veld Deterioration.

If these and other data are analysed, one can only come to the conclusion that a large section of the southern Orange Free State must have consisted of grassveld and that shrub bush is steadily encroaching northwards.

The factors responsible for this state of affairs must not be sought only in the farming methods practised to-day; they originated in the remote past. Some of these factoros may be considered here.—

(a) *Antelopes, Diseases and Pests.*—When the first Europeans entered the Free State, the grazing was by no means in an undamaged condition. Hundreds of thousands of antelope had for years been cropping away the best grasses, with the result that extensive areas of grassveld had become " sour " and unpalatable. For many years the early stock farmers were compelled to herd their animals and to kraal them at night in order to protect them from the numerous beasts of prey like lions, hyenas, wild dogs, etc., with consequent unnecessary trampling of the veld. Locusts were a serious menace, especially in dry years, and at that time there was as yet no concerted and co-ordinated action in Southern Africa to control this pest (4), (7) and (8).

(*b*) *Periodic severe droughts* like those of 1852, 1862, 1895, 1902, 1906, 1914, 1919, etc., did vast damage to the veld. Wealthy farmers went bankrupt in 1862, and vegteables were sold on the Bloemfontein market at £6 for half a grain-bag full(7). In 1914 even hardy wild olive trees succumbed.

(*c*) *The Bantu Tribes* had scant respect for the soil and kept large herds, mostly of cattle and, to a smaller extent sheep and goats. In order to obtain good grazing for these animals as well as for the game which they hunted, and also to exterminate snakes and vermin in the tall grass, they burnt the veld annually (3) and(9).

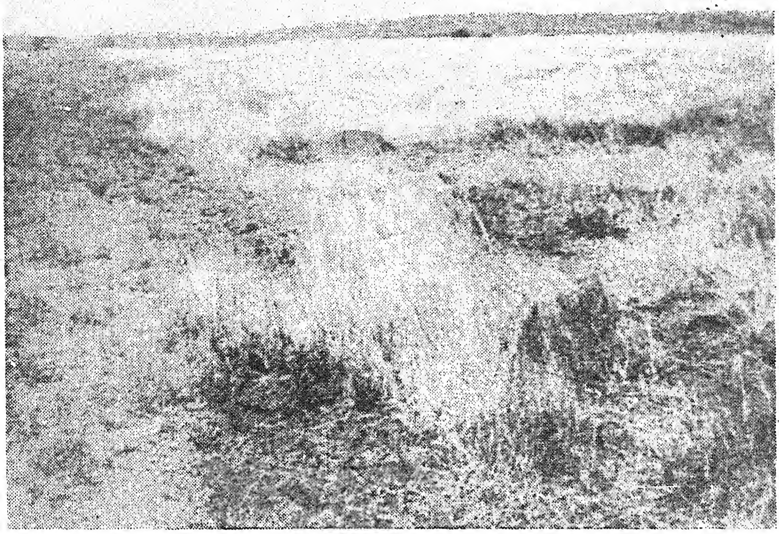


FIG. 4.—Trampled out grassveld where steekgras (right) is now predominant. Note the bare patches and the encroachment of inferior shrubs on the left.

The Griquas, who inhabited the area between the Orange and Modder Rivers, kept large numbers of livestock and it is, therefore, obvious that the veld was already heavily burdened when the first Trek-farmers entered this area in 1821.

(*d*) *Deforestation.*—The Bantu played an important part in the eradication of our indigenous forests. They not only destroyed all trees in the vicinity of their kraals, but were also in the habit of burning the veld, and, therefore, the trees.

This process was later aggravated by the development of the diamond mines. Firewood was required for the boilers, with the result that no tree within a radius of hundreds of miles of Kimberley was safe. The thorn-trees and camelthorn forests south of the Riet River, mentioned by Cummings on his trip eastwards from the confluence of the Orange and Vaal Rivers, vanished like mist before the sun under the stroke of the axe. Wood-prices soared to unprecedented heights, and in Kimberley up to £35 was paid for half a waggonload(8).

Plant Succession.

(*a*) *Red-grass Veld.*—As has already been mentioned, there is ample evidence that the familiar red-grass veld formerly extended much further south, but that it disappeared from large areas

as a result of mismanagement of the veld. This is a very unfortunate circumstance, since red grass is one of our most valuable veld grasses. It is excellent for haymaking purposes and all livestock eat it eagerly as long as there is something to nibble at. Given the opportunity to grow unhampered, it forms a thick mat which very effectively prevents soil erosion. Obviously, that is why the Department of Agriculture is so anxious to-day to re-establish red grass on trampled veld.

With its shallow root system, however, it has no great drought resistance. Moreover, its innovation nodes are situated near the surface and that is why this grass disappears so easily where overgrazing, trampling and veld burning take place. It is particularly

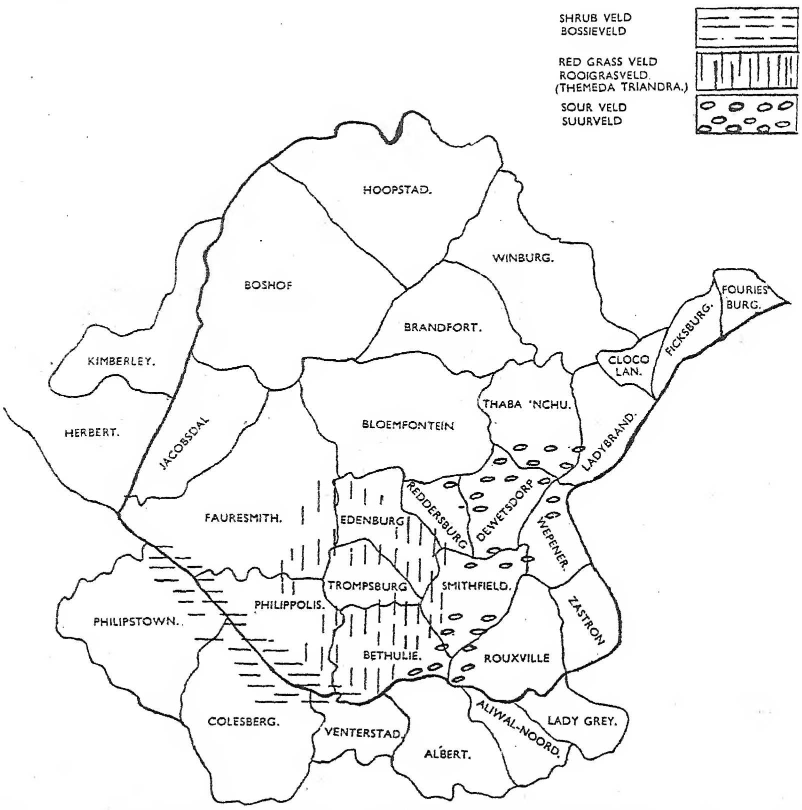


FIG. 5.—Limits of shrub veld a century ago.

sensitive to summer burning. On the other hand, when properly controlled, red grass with its spreading root system easily ousts its xerophytic neighbours* under favourable conditions(5).

If red grass is abused, however, it is gradually superseded by its xerophytic neighbours (*Eragrotis* "blousaadgras" species) because they all have deep root systems and deep-seated innovation nodes. The *Eragrotis* species are not so easily trampled by stock(5).

In spring, or as young regrowth after burning, animals readily eat these grasses, but as the plants develop and reach maturity, they become increasingly unpalatable and in autumn and winter they

* That is, plants with high drought resistance.

are practically unfit for grazing. Their hay is not as palatable as that of red grass, and the mown veld is useless as grazing, especially for sheep, for the hard stubble injures the mouths of grazing animals. In this group of grasses we find the well-known "knietjiesgras" which is an important factor in the veld-conservation campaign. It is not only easily propagated from seed, but the culms bend down and take root, thus forming new plants.

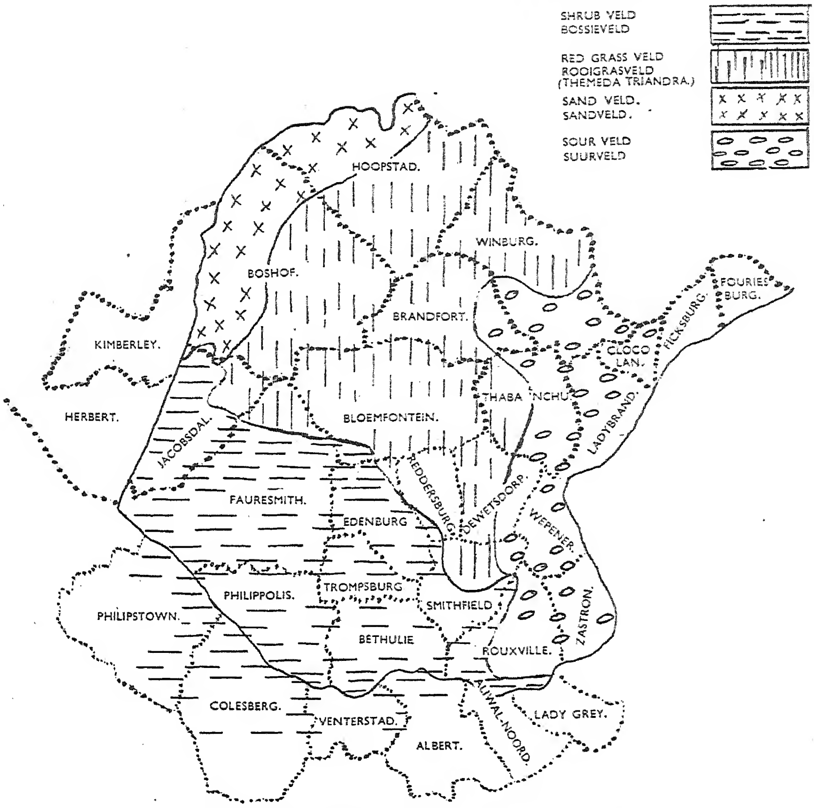


FIG. 6.—Limits of shrub veld to-day.

If *Eragrostis* veld is, however, exposed to overstocking, the plant succession receives a further set-back to the *Aristida* or steekgras stage. These pioneer grasses have very little value as grazing and when the seeds find their way into the wool of merino sheep the animals suffer agonies. The presence of large amounts of seed in the wool also causes considerable financial loss annually on the wool clip.

If this veld is subjected to further trampling, bare patches develop, and the final result is soil erosion with all its attendant evils. Fortunately, if Nature is given the opportunity, it can heal the veld by providing quick grass to cover the bare patches. This quick grass (*Cynodon*) is, however, one of our most inferior grasses in that it is apt to cause geilsiekte when wilted[10].

(*b*) *Shrub or Karrooveld.*—As has been indicated, no definite line of demarcation can be drawn between grassveld and shrub veld in the south-western Orange Free State, since one type gradually merges into another. With the disappearance of red grass and the

ascendancy of "blousaadgras" and steekgras varieties, however, shrub encroachment comes into prominence. The nutritive value of these bushes, especially during the winter months, and their resistance to drought were well known to the Trek-farmers, who encouraged their development in every possible way. The value of good shrub veld is readily recognized, but from the point of view of soil conservation, the encroachment of this type of veld is dangerous. In contrast to grassveld, shrub veld is open and during heavy downpours the water flows off freely. In other words, soil erosion takes place much more rapidly than where the veld is covered with grass. There is no objection to bushes on level ground where run-off is slow, but on slopes the grass cover must be maintained and encouraged at all costs. Furthermore, the carrying capacity of shrub veld is, of course, lower than that of good grassveld.

In the southern Orange Free State a fair variety of good Karroo bushes is found, like the well-known " kapok " bush, " skaapbos ", " kerriebos ", blue and white aster, " vyebos ", " daggabossie ", " perdekaroo ", " aarbossie " and also various varieties of " ganna " bush on low-lying ground.

Unfortunately these good bushes are not always able to endure as much as is expected of them. If they are over-grazed, veld deterioration gains a further foothold and bitter-bush becomes predominant, a condition which is already prevalent to-day. Although this plant annually causes considerable stock losses, it is understandable why farmers sometimes try to justify its existence on the grounds that at times the animals eat it readily enough; but in the absence of other food, animals will eat anything to keep alive. It is quite incorrect to refer to bitter-bush veld as Karrooveld, for, although bitter-bush is to be found in trampled areas on true Karrooveld, it has no association with good Karrooveld. Every bitter-bush must be regarded as a sign of veld deterioration.

Summary.

The writer has attempted to indicate briefly the condition of parts of veld in the past, in contrast to the present position. There is every reason to believe that, with judicious veld control, these pastures can be largely restored and their carrying capacity increased. On the other hand, Nature is warning us that what has already taken place in the southern Free State, may also happen in our good grassveld areas in other parts of the country.

[Red grass in this article refers to what farmers commonly call " rooi platblaargras " and not to spear grass (swartangelgras) with which " rooigras " is often confused.]

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The Feeding of Farm Animals.

J. C. Bonsma, Division of Agricultural Education and Research.

I. Dairy Cattle.*

IF the feeding of farm animals is to be successful, certain requirements have to be complied with. In the first instance, attention must be paid to the nature and quality of the feeds to be used in the mixing process, after which the rations must be made up to comply with the nutritional requirements of the animals to be fed.

Main Requirements to which Rations must Conform.

1. *Suitability of feeds.*—The feeds used in making up rations, or fed as such to the animals, must be of a quality not likely to have any injurious effect on either the animal or its final product such as milk, meat, eggs, etc. In this connection farmers are reminded especially of weeds, such as Khakibush in teff and hay, and of impurities such as sand and dust in concentrates, and in the byproducts of mills. In additioin, feeds must be utilized in such a manner that they will not taint the final animal product. In this connection one thinks of the effect of too much fish meal in fowl rations, which makes eggs practically unfit for use owing to their unpleasant flavour. Certain types of clover affect the flavour and odour of milk.

Feeds which may be effectively utilized by certain types of livestock, are often unsuitable or even harmful to others. Cottonseed meal is a good feed for cattle, although it is poisonous to pigs if it constitutes more than 10 per cent. of the concentrate ration.

Furthermore, the efficacy of many types of feed depends on the proportions and combination in which they are mixed with other feeds. An effective concentrate ration is obtained by mixing feeds of various origin. The proteins, for example, which are derived from leguminous crops, must be mixed with concentrates derived from cereals. Vegetable proteins, on the other hand, must be mixed with animal proteins.

(2) *Bulkiness of the ration.*—Bulkiness in a ration is a requirement which must not be overlooked, and which varies for every class of livestock. Cattle, horses and sheep utilize coarse feeds very effectively, consequently a considerable amount of bulkiness must be supplied in their rations to enable their digestive systems to function properly and to keep them in a good state of health. Pigs and poultry are poor digesters of crude fibre and their digestive systems may easily be upset if their rations are too bulky.

In general, hard working or high-producing animals should receive a larger proportion of concentrates in their rations, and consequently the bulkiness decreases proportionately.

(3) *Palatability.*—If rations are unpalatable, animals usually eat less of it, and such rations are usually also poorly digested. In fact, when rations are unpalatable, it is almost impossible to induce fattening animals or high-producing dairy cows to eat sufficient for their needs. Flavour is only one of the factors which determines the palatability of food. This factor is often exploited

* The feeding of slaughter cattle and pigs will be dealt with in subsequent editions.

when making up commercial rations. Aniseed, for example, is added to the mixture to encourage animals to eat more of an otherwise unpalatable ration.

Odour also plays an important rôle in determining whether or not a ration is palatable. Some animal proteins, such as fish meal, blood meal or meat meal, often have an unpleasant odour; consequently animals may refuse to eat rations which contain a fair proportion of these animal proteins. To accustom animals to the odour of these constituents, the amounts included in the rations must be increased very gradually.

Coarseness, fineness, dustiness, dryness and moistness are physical properties which all influence the palatability of rations.

(4) *Variety*.—A variety of feeds included in a ration also adds to its palatability and promotes the biological value or assimilability of proteins in the ration. It also ensures the ration against a shortage of nutrients such as amino acids, minerals or even vitamins.

Special care must be taken that the protein constituents of the ration are derived from different sources, e.g. from legumes, cereals and also animals (fish meal, blood meal, etc.).

Proteins are the principal constituents of the vital organs and soft tissues of the animals' body. For this reason it is absolutely essential to ensure that animals receive sufficient quantities of proteins in their ration throughout life.

The term protein is very comprehensive and includes a group of closely related yet chemically distinct combinations. Vegetable proteins differ from each other, and as a group again differ from animal proteins.

Each protein consists of a number of different amino acids combined to form a compound protein molecule.

It has been ascertained that vegetable and animal proteins consist of at least 23 amino acids, the main difference between proteins being the nature and number of the various amino acids present. Amino acids are the final products of protein digestion and the building stones from which the body proteins are formed. Amino acids therefore constitute the central point on which the whole study of protein feeding pivots.

The various feeds must therefore be selected in such a way that the nutrient deficiencies of some are supplemented by the presence of others. In this manner cereals can supplement the deficiency occurring in legumes and vice versa. Cotton-seed meal and groundnut oilcake contain practically the same amino acids and are therefore unable to supplement each other. Consequently only one of these is used in a ration, not both. Animal proteins contain amino acids which are either present in small quantities or entirely lacking in vegetable proteins; consequently it is desirable to supplement the shortage of amino acids in vegetable proteins by the addition of animal proteins.

As a rule animal proteins are particularly rich in the four essential amino acids, viz., tryptophane, lysine, cystine and histidine, which usually occur in very limited quantities in vegetable proteins.

(5) *Fat content*.—Although the feeding standards do not as a rule mention the quantity of fat which should be present in a well-balanced ration, recent research has revealed a few important facts in connection with this nutrient.

Fats with a low melting point, such as soybean oil, must be limited to a minimum in pig rations, since feeds containing soft fats and oils are inclined to form soft fat in the carcase. These types of

feed may be utilized effectively, however, in the feeding of dairy cows. Rations for dairy cows must provide sufficient fat for the partial replacement of that lost in milk production. From 3½ to 4 per cent. is needed, and for this reason it is necessary to include vegetable feeds such as oilcakes or linseed meal in the concentrate ration.

(6) *Balance of nutrients.*—Rations for all classes of livestock should contain the essential ingredients, such as carbohydrates, proteins, fats and minerals, in the correct proportions.

(7) *Costs.*—In mixing and buying concentrates, attention must necessarily be paid to the cost of the ingredients. The cost of a ration is not the only basis, however, on which to determine whether it is economical or not. Feeds vary considerably as regards their digestibility, and therefore the cost per unit of digestible or metabolizable nutrients in the feed must be the dominating factor rather than the cost per unit of the feed as such.

Description of Feeds.

(1) *Basic concentrates.*—In this country concentrates with a low protein content, such as maize, oats, wheat, barley, etc., should form the basis of concentrate rations, since these feeds are reasonably plentiful and cheap in normal times. They should be mixed with the supplementary protein-rich concentrates in order to give a balanced concentrate ration. It may generally be said that any type of cereal or cereal byproduct of the milling process, containing from 8 to 12 per cent. of protein, is a basic concentrate, provided it does not contain too much roughage.

Basic concentrates should constitute approximately 60 per cent. of a balanced concentrate ration.

(2) *Supplementary feed.*—In order to balance the basic concentrate ration with a view to meeting the feed requirements of, e.g. dairy cows, pigs and poultry, special feeds which will supplement deficiencies of proteins, minerals and possibly vitamins in the basic ration must be added.

(*a*) *Protein supplementary feed.*—Feeds or mixtures with a high protein content, usually at least 15 per cent., are used to supplement the basic ration as regards protein requirements. Protein-rich concentrates of vegetable origin, which are commonly used for this purpose include groundnut oilcake, linseed meal, cotton-seed meal, maize germ meal, etc. The latter will usually constitute 10 to 30 per cent. of the meal ration.

Feeding good-quality crops such as lucerne hay, cowpea hay, soyabean hay, etc., can effect a saving in the use of protein-rich concentrates.

Animal proteins, such as fish meal, blood meal and meat meal, are often used to supplement the protein content of basic concentrate rations. These feeds usually constitute 2 to 10 per cent. of the meal ration of farm animals.

(*b*) *Mineral supplementary feeds.*—Minerals should always be added to concentrate rations, and the nature and quantity depend on the ration and the type of animal to be fed. In the case of dairy cows, bonemeal, salt and, occasionally, ground limestone may be added. It is particularly important to add 1 to 2 per cent. of common salt to the rations of dairy cows.

The amount of minerals included in concentrate mixtures usually varies from 2 to 5 per cent.

(c) *Vitamin supplementary feeds.*—In the feeding of pigs, small quantities of codliver oil are sometimes added to concentrate rations to increase its vitamin A and D content. Half a teaspoon of vitaminized oil is sufficient for a pig for 2 days. It is not desirable to vitaminize large supplies of feed with oil, since most vitamin-rich substances lose their vitamin content after having been exposed to air and light for a short period.

It must be emphasized, however, that if a ration is properly balanced it is not likely that there will be a vitamin shortage. If farm animals have access to green feed, there is practically no possibility of their suffering from any vitamin deficiency.

Practical Application of the above Hints.

A. Cows in Milk.

(1) In making up concentrate rations for dairy cows, due allowance must be made for bulkiness by mixing heavy feeds, such as mealie meal or groundnut oilcake with light feeds such as wheaten bran. The weight of the concentrate mixture should be approximately 1 lb. per quart measure, or 16 lb. per paraffin tin.

(2) The necessary variety must be introduced if possible, by mixing 5 or more feeds from different sources. In order to increase digestibility, at least two of the constituents should have a laxative effect. Wheaten bran and linseed meal are suitable for this purpose.

(3) The amount of crude fibre in the concentrate ration for dairy cows, should not exceed 10 to 12 per cent. For this reason it is not advisable to add large quantities of maize and cob meal to a concentrate ration for dairy cows. Small quantities, however, often have a beneficial effect on the digestibility of concentrate rations.

(4) If the fat content of a concentrate mixture is too low, the ration will, as a rule, be low in digestibility. It is advisable, therefore, to keep the fat content of the ration high enough by adding oilcake, such as groundnut oilcake, or sufficient quantities of certain leguminous seeds, such as soybeans, velvet beans, etc.

B. Rules for the Feeding of Dairy Cows.*

In feeding concentrate rations, made up as indicated above, to dairy cows, the following rules must be observed:

(a) *Roughage requirements.*—Dry roughage, such as lucerne hay, teff hay and other types of hay, should, to a large extent, meet the maintenance requirements of cows. Cows should receive approximately 2½ lb. of hay for every 100 lb. live weight.

Half of the cow's dry roughage ration can be replaced by succulent roughages on the following basis, viz., 3 lb. of silage or 5 lb. of mangels to replace 1 lb. of dry hay.

(b) *Concentrate feeding.*—Cows on green grazing, such as oats or lucerne, can produce large quantities of milk without receiving any concentrates. In many cases cows produce 3 to 4 gallons of

* A fuller description of the scientific basis on which rations are calculated will be included with a reprint of this article.

milk per day from artificial grazing without the addition of concentrates.

Producing cows which have no access to green grazing, should receive a certain amount of concentrates additional to the roughage allowance. Cows with a butterfat test not exceeding 4 per cent. (Frieslands, Shorthorns and Ayrshires) should not receive any concentrates if their production is less than 1½ gallons per day; for higher production they should receive 3 lb. of concentrates for every gallon of milk produced. If the butterfat tests of cow's milk exceeds 4·5 to 5 per cent. (e.g. Jerseys and Guernseys) they receive no concentrates for the first gallon of milk; higher producers, however, receive 4 lb. of concentrates for every gallon of milk produced.

According to the feed requirements of milch cows, as prescribed by various research workers, it is clear that the composition and quality of a concentrate it determined by the nature and quality of the available roughage.

TABLE 1.—*Feed Requirements of Dairy Cows.*

Daily requirements per animal.

Weight of Cow.	Dry material (2 to 2½ per cent. of body-weight.)	Digestible Protein.	OR Crude Protein.	Total digestible nutrients.	Calcium (Ca).	Phosphorus (P).
(*a*) FOR MAINTENANCE.						
lb.	lb.	lb.	lb.	lb.	oz.	oz.
700.............	18	0·48	0·56	6·0	¼	¼
1,000.............	25	0·65	0·85	8·0	⅓	⅓
1,200.............	30	0·75	1·00	9·5	½	½
1,400.............	35	0·90	1·20	11·0	½	⅓
(*b*) FOR PREGNANCY (*last 2 months*)						
lb.						
700.............	20–22	0·90	1·20	10	¾	½
1,000.............	28–30	1·20	1·60	14	1	⅔
1,200.............	32–34	1·40	1·90	16	1⅓	1
1,400.............	38–40	1·60	2·20	19	1½	1¼
(*c*) ADDITIONAL REQUIREMENTS FOR MILK PRODUCTION (*per gall. or* 10lb. *of milk*).						
Butterfat percentage of cow.						
3 per cent.........	6	0·40	0·50	2·8	4 per cent of the concentrate ration.	
4 per cent.........	6½	0·50	0·65	3·2		
5 per cent.........	7	0·60	0·75	3·7		
6 per cent.........	8	0·65	0·80	4·2		

Digestible protein content is usually calculated on the basis of 75 to 80 per cent. digestibility of the crude protein in a concentrate ration.

The amount of feed required according to Table I is calculated on the following basis :—

1. A cow requires 2½ to 3 lb. of dry material per 100lb. live weight.
2. A cow weighing 1,000 lb. requires 0·65 lb. of digestible protein (D.P.) for maintenance in order to replace the daily loss of protein from the body, as well as 0·4 lb. to 0·65 lb. of digestible protein per gallon of milk produced (3·0 to 6 per cent butterfat).

Therefore a cow weighing 1,000lb. and producing 3 gallons of milk testing 3 per cent. butterfat, requires (A) 0·65 lb. D.P. for maintenance and (B) gallons of milk. $\times$D.P., i.e. $3 \times 0{\cdot}4 = 1{\cdot}2$ lb. of digestible proteins for milk production.

The D.P. requirements for maintenance and milk production are, therefore, equal to (A) + (B), i.e. $0{\cdot}65 + 1{\cdot}2$ lb. D.P. = 1·85 lb. D.P.

3. The total digestible nutrients (T.D.N.) in a ration are calculated on the digestibility of the nutrients in the ration and the amount of fat which they contain. This usually varies in average value from 30 to 50 per cent. in the case of dry roughage to 50 to 80 per cent. in the case of concentrates. It is therefore clear that the amount of total digestible nutrients in the ration will rise as the proportion of concentrates is increased.

4. In some cases, the protein content of a ration is experssed as its nutritive ratio. The nutritive ratio of a ration is the ratio of digestible proteins or protein ingredients to the non-protein ingredients in the ration. The nutritive ratio is expressed as follows :—

$$\text{Nutritive ratio} = \frac{\text{Total digestible nutrients—digestible protein.}}{\text{Digestible protein.}}$$

The higher the percentage of digestible protein in a ration rises, the narrower the nutritive ratio becomes; or, generally speaking, the more concentrates a cow receives, the narrower the nutritive ratio of her daily ration becomes.

From table 1 it is clear that the nature of the roughage will determine how high the concentrate ration must be in digestible protein and other nutrients in order to fulfil the requirements of dairy cows. For example, if the roughage is low in digestible protein and total digestible nutrients the concentrate ration must be high in digestible nutrients and digestible protein.

Table 2 indicates the amount of digestible protein or crude protein which the concentrate mixture must contain when fed with the various types of roughage. An example is also given of a concentrate ration which fulfils these requirements.

TABLE 2.—*Digestible Proteins Needed in Concentrate Mixtures fed with Roughage.*

Available roughage	Approximate percentage of crude protein in concentrate mixtures needed with roughage.	Approximate percentage of *digestible* protein in concentrate mixtures needed with roughage.	Composition of Cereal Mixture.			
			Mealie meal.	Oat-meal or dried brewers' grains.	Maize germ meal.	Ground-nut meal.
	%	%	lb.	lb.	lb.	lb.
Legume hay only e.g. lucerne hay or cow-pea hay...	12 to 14	10	900	300	200	100
Legume hay and silage..........	14 to 16	12	500	200	200	200
50 per cent. legume hay and 50 per cent. teff hay; or 50 per cent. legume hay and 50 per cent. sweet-grass hay......	14 to 16	12	500	200	200	200
Hay, mixed as above; and silage	18 to 20	16	200	200	200	200
Grass hay, teff hay, and silage.......	20 to 24	18	100	200	200	200

The biological protein value of a concentrate ration for cattle will be considerably improved by the addition of 2 to 3 per cent. of fish meal or blood meal.

The following table is a good guide for the feeding of dairy cows according to the requirements indicated in tables 1 and 2.

(Cows weighing from 1,000 to 1,200 lb.)

TABLE 3.—*Feed Schedule for Dairy Cows with Varying Production.*

Milk produced per day..	lb. 10	lb. 15	lb. 20	lb. 25	lb. 30	lb. 35	lb. 40	lb. 45	lb. 50
Concentrates per cow per day if milk test is 4·0% or lower.......	0	2½	5	7	9	11	13	15	17
Concentrates per cow per day if milk test exceeds 4·0% butter-fat.................	3	5	8	11	14	17	20	22	24
*Hay per day.........	12	13	11	11	10	10	9	9	8
*Silage per day........	36	38	33	33	30	30	27	27	24
Total dry material in ration per day.......	22	23	24	25	26	27	28	29	30

* As a rule cows are fed hay and silage *ad lib,* but animals weighing 1,000lb. will eat approximately the amount shown in Table 3. For cows weighing more than 1,000 lb., the amount of hay and silage consumed will increase in proportion to the weight of the cow.

Mineral Requirements.

Salt and bonemeal are absolutely essential for dairy cows; 2 to 4 lb. of a mixture of 2 parts of bonemeal and one part of salt must be added to every 100 lb. of concentrate mixture; in addition cows should have free access to this mineral mixture.

Dairy cows build up reasonably large supplies of lime (calcium) and phosphorus in their bone tissue, which can again be liberated for milk production if there is a shortage of these minerals in the ration. No salt reserve is built up in the animal body.

Calculations indicate that the body of a cow weighing 1,000 lb., contains approximately 40 lb. of calcium phosphate but only 3 to 4 lb. of salt. In 10,000 lb. of milk she secretes 30 lb. of calcium phosphate and approximately 20 lb. of salt.

From the above it is clear that proportionately, a cow secretes much more salt in her milk than calcium and phosphorus.

A deficiency of calcium and phosphorus can be met temporarily by using up the reserves stored in the body. There is no similar means by which a deficiency of sodium chloride can be made good.

A cow needs from 20 to 30 lb. of salt annually to replace the supplies excreted in milk, drivel, urine, etc. She should therefore receive 1 to 1½ ounces of salt in her daily ration or otherwise have free access to salt. An average-sized cow requires ± 1 ounce of salt daily for maintenance, plus ¼ ounce for every 10 lb. of milk produced per day. Cattle require more salt in summer than in winter.

The Feeding of Dry Cows.

High-producing cows receive large quantities of concentrates during lactation; consequently it is desirable to feed them well during the short period when they are dry.

Optimum feeding is especially advisable in the case of pregnant cows, which are to calve within 2 to 3 weeks. Cows need a well-balanced concentrate ration to stimulate the growth of udder and tissue of the sexual organs associated with heavy pregnancy. If a cow is not properly cared for during the last weeks of pregnancy, she will be unable to have a good lactation. Cases have repeatedly been observed where farmers feed their cows well while they are in production, but put them on poor grazing when dry. When these cows calve, they are again given good rations but fail to reach a satisfactory level of milk production.

Feeding a cow a good balanced ration during lactation and immediately thereafter putting her on poor grazing, has a detrimental effect on milk production. As a rule, such a cow will not succeed in regaining the high level of milk production of her previous lactation.

The optimum period between lactations is from 30 to 60 days, which allows the cow to build up reserve supplies of minerals, fats and vitamins for the coming period of production.

If pregnant dry cows are kept on good green grazing, it is unnecessary to give them any supplementary feed, since green feed is rich in vitamin A (carotin), protein, minerals and other nutrients, all in a highly assimilable form.

It seems very reasonable that cows should be fed well during their dry periods, since they put on fat very rapidly during the last stages of pregnancy. The storage of fat is accompanied by an accumulation of minerals and vitamins in the animal's body to serve as a reserve during lactation.

Feeding of Young Dairy Animals.

Heifers in the herd, which have reached the age of one year, can be kept on grazing alone, provided the grazing is good. If this is not the case, the heifers should have free access to hay. Lucerne hay is particularly suitable for young growing heifers.

If heifers are due to calve just after reaching the age of two years, they should receive approximately 4 lb. of concentrates per day during their second year.

Heifers to be bred, should be well grown for their age and in good condition.

Feeding of the Bull.

Bulls must receive just sufficient feed to keep them in medium condition. In no circumstances should they be allowed to become over-fat, since that tends to make them sluggish.

It is advisable to add a small quantity of oatmeal to the concentrate ration fed to bulls. Oatmeal is a type of feed which contains a fair amount of manganese, a mineral which is important in the feeding of male animals with a view to promoting fertility.

As a rule, the animal proteins in concentrate rations for bulls give good results, and for that reason 2 to 5 per cent. of fish meal, or blood meal of good quality should be added to the mixture.

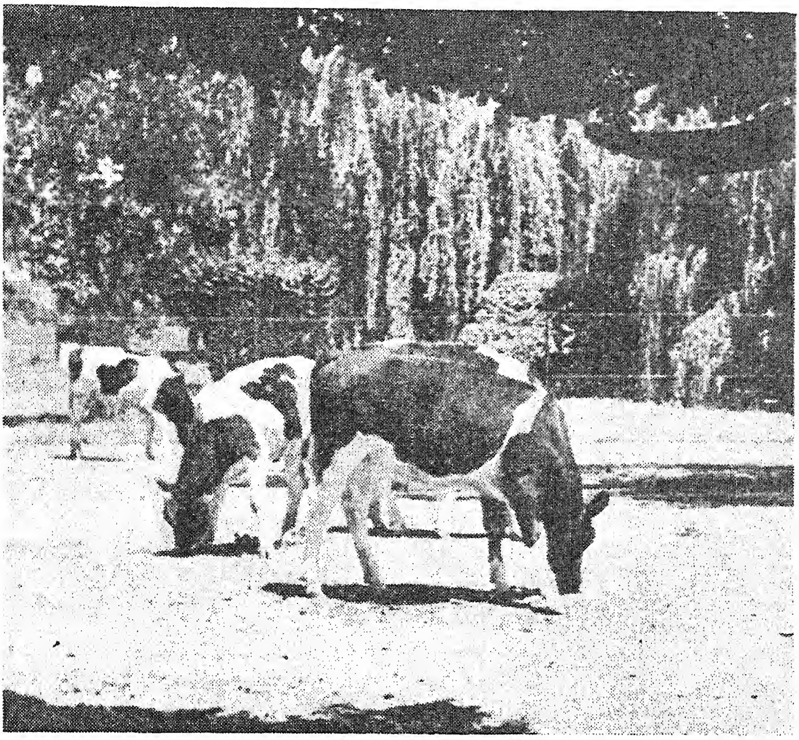
Bulls should receive from 4 to 10 lb. of concentrates per day; 6 lb. is a good average. The quantity depends on the amount of work the bull has to do and on his condition.

A concentrate ration consisting of the following, should yield good results: 400 lb. of mealiemeal; 150 lb. of maize germ meal; 150 lb. of wheaten bran; 150 lb. of oatmeal; 100 lb. of groundnut oilcake; 50 lb. of fish meal. Total 1,000 lb. A 3 per cent. mixture of bone meal and salt must be added to the above

Illustrated Advice.

The following photos with suitable legends give good advice in connection with the feeding and care of dairy cows.

Fig. 1.—The Heifer Calves of To-day are the Dairy Cows of To-morrow.

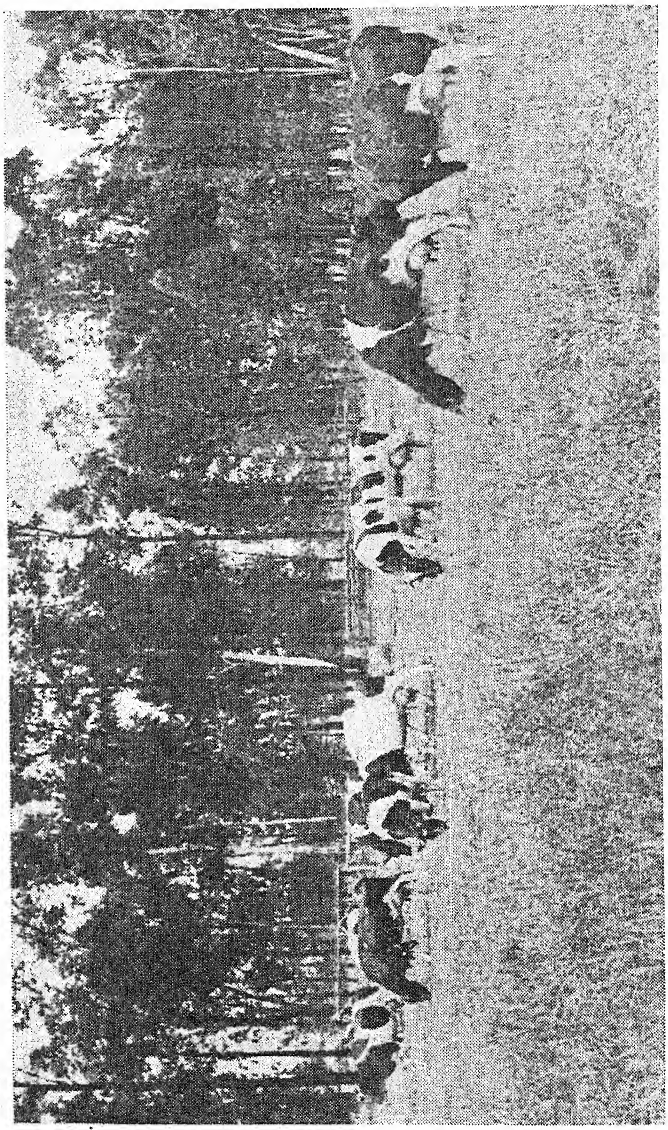


Good management begins with the correct treatment and care of the newborn calf.

Calves should be born in clean surroundings.
It is absolutely essential that the calf should receive the mother's colostrum, which contains large quantities of vitamin A and helps the calf to build up resistance against disease.

The ordinary procedure is to feed the calf on whole milk for 3 weeks and then gradually to change to skim milk. Calves will drink from 6 lb. to 15 lb. of milk per day, according to their size. The weight of the milk fed, must be approximately 10 per cent. of the calf's bodyweight. At the age of 3 to 4 weeks the calf will begin to nibble green grass or hay, and should then be permitted to eat good hay or grazing. Young calves must always have free access to *clean water.*

Fig. 2.—Good Cows on Good Grazing.



Good grazing is practically the ideal feed for cows, and should form the basis of milk production.

Only high-producing cows need concentrates in addition to good grazing.

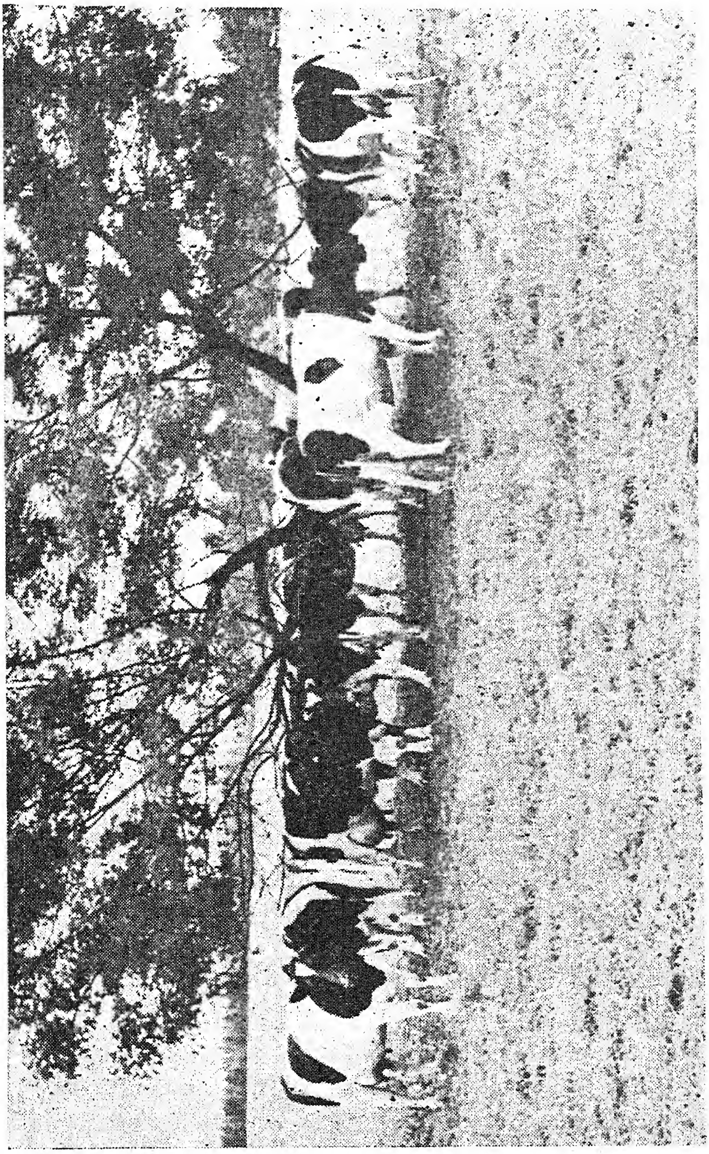
Growing grass is rich in proteins and vitamins which stimulate milk production. It contains so much moisture, however, that high-producing cows cannot eat sufficient quantities of it to meet their needs in regard to the carbohydrates required for energy.

If kept on good grazing, cows can yield 30 lb. (3 gall.) of milk or more per day.

Cows kept on good *early* summer grazing or pasture must receive 3 to 4 lb. of concentrates for every gallon they produce in excess of 3 gallons.

If kept on summer grazing, they must receive the same quantity of concentrates for every gallon over 2½ gallons. On *late* summer grazing, they must receive the same quantity of feed per gallon for production exceeding 1½ to 2 gallons.

Fig. 3.—Cows Peacefully Chewing the Cud in the Shade of a Tree.



Cows on summer grazing need shade during the hottest time of the day.

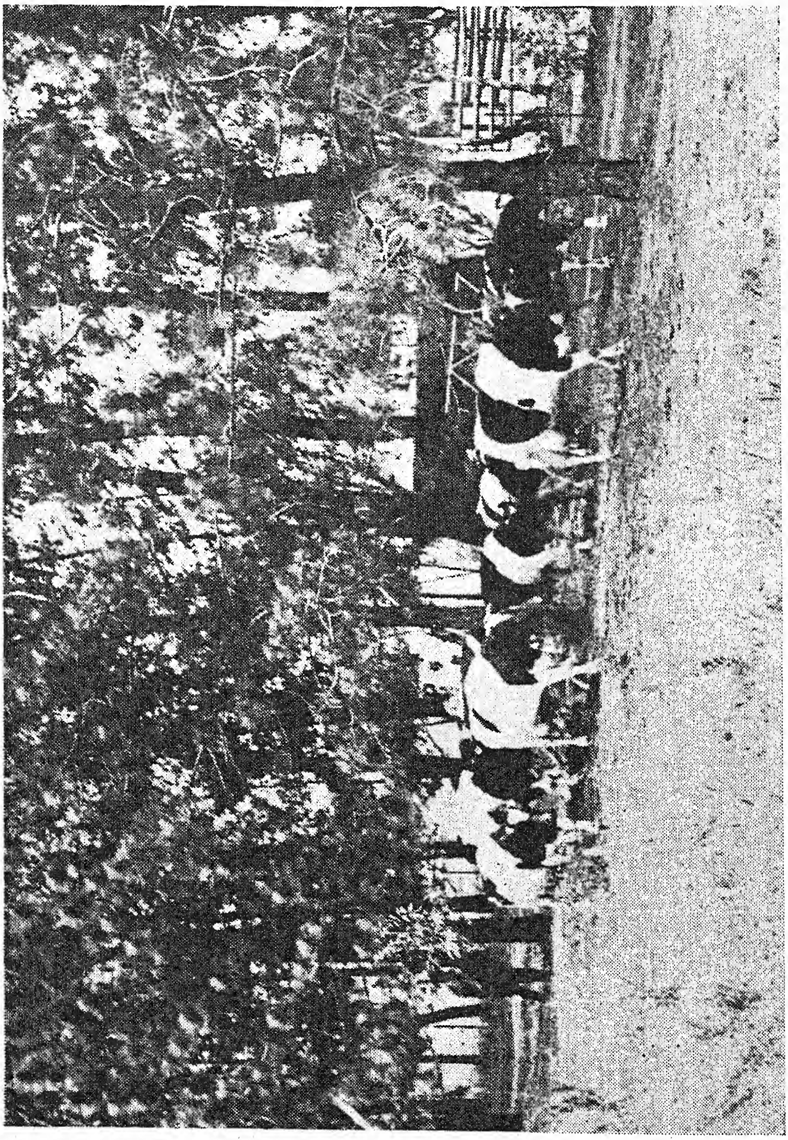
Cattle have few sweat glands, consequently they cannot stand heat.

Excessive heat has a considerably depressing effect on milk production.

Cows are particularly sensitive to temperatures above 85° F. Their production can decline by as much as 30 to 40 percent, if they have no protection against direct sunlight on hot days.

It is advisable to plant shady trees or to erect shelters against the direct rays of the sun in the grazing camps.

Fig. 4.—Cows on their way to the Stable to be Milked.



When cows are taken to the stables to be milked, they must walk slowly.

Experiments have shown that cows driven hurriedly to the milking shed, yielded 30 percent less milk than those allowed to walk slowly, even over shorter distances than 1 mile.

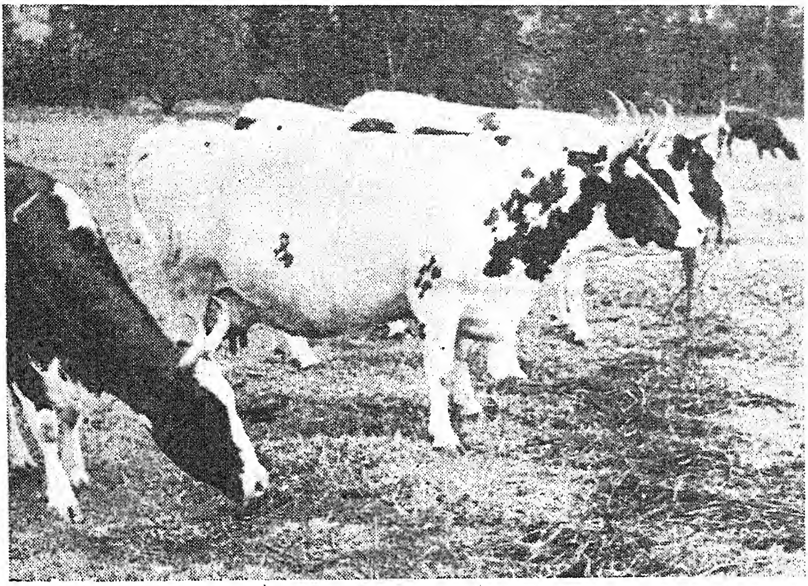
If the grazing is poor, it is a waste of energy for the cow to walk so far.

High-producing cows tire quickly, with a resultant decline in milk production.

For this reason town-dwellers must never allow their servants to fetch cows by bicycle, since this can cause a decrease of at least one third in their milk production.

Rapid movement and the consequent shaking of the udder may result in injury.

Fig. 5.—Silage is an Insurance against Drought. Cows Revelling in Grass and Lucerne Silage.



Dairy farmers on the highveld and in areas where silage crops can be cultivated, must seriously apply themselves to producing as much silage as possible.

Silage is an excellent succulent feed for winter feeding. It is rich in carotin (Vitamin A) which, as a rule, is scarce in winter feed.

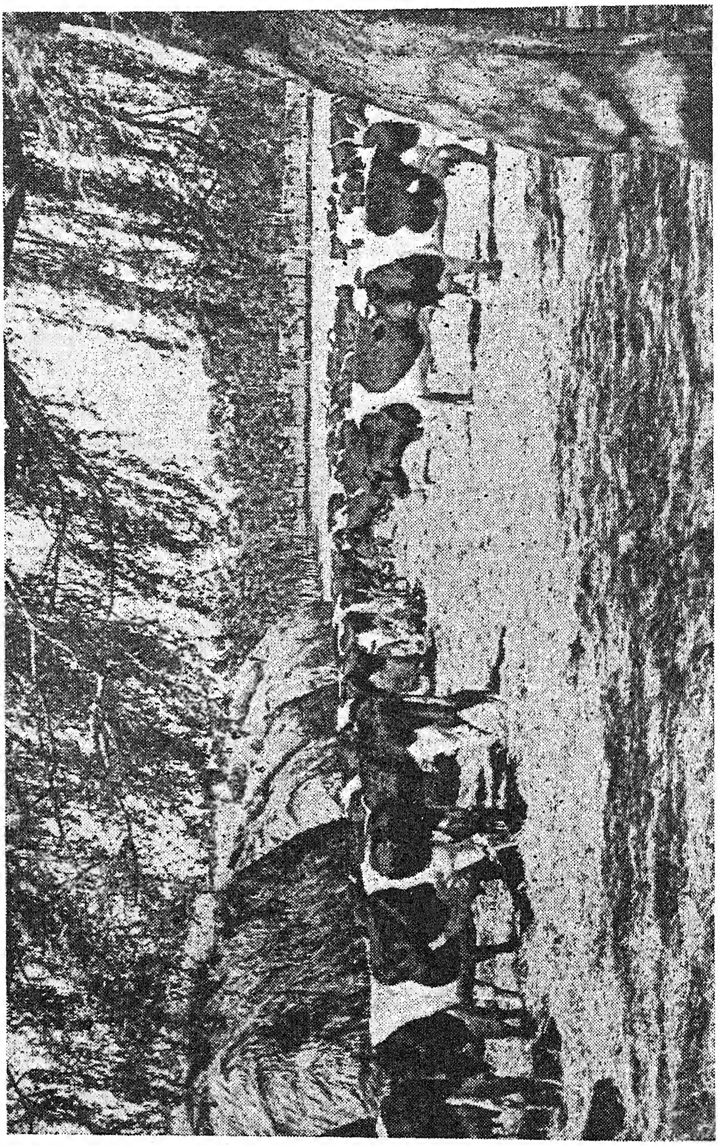
The succulence in silage promotes the digestion of dry hay and supplements the deficiency of nutrients in hay. Silage can be made from maize, sorghums, legumes, grasses, etc.

Cows can consume from 30 to 50 lbs. of silage per day.

Half of the cow's daily hay ration can be replaced by silage, viz., on the basis of 3lb. of silage to replace 1 lb. of hay.

Remember that silage made of legumes, grasses and cereals fits into a scheme of conservation farming.

Fig. 6.—Large Haystacks are the Best Insurance against Drought.



In areas where no winter grazing is available, a large supply of good quality hay must form the basis of winter milk production.

Cows will eat more hay if it is fed out-of-doors. Hay must be eaten from racks and the haystacks must be in sheltered spots where trees form protection against the winter wind.

On the accompanying photograph, the haystacks are in the correct spot, but the lack of hay racks causes waste.

If the cows have free access to water near the hay racks, they will eat more hay and will be less inclined to become constipated.

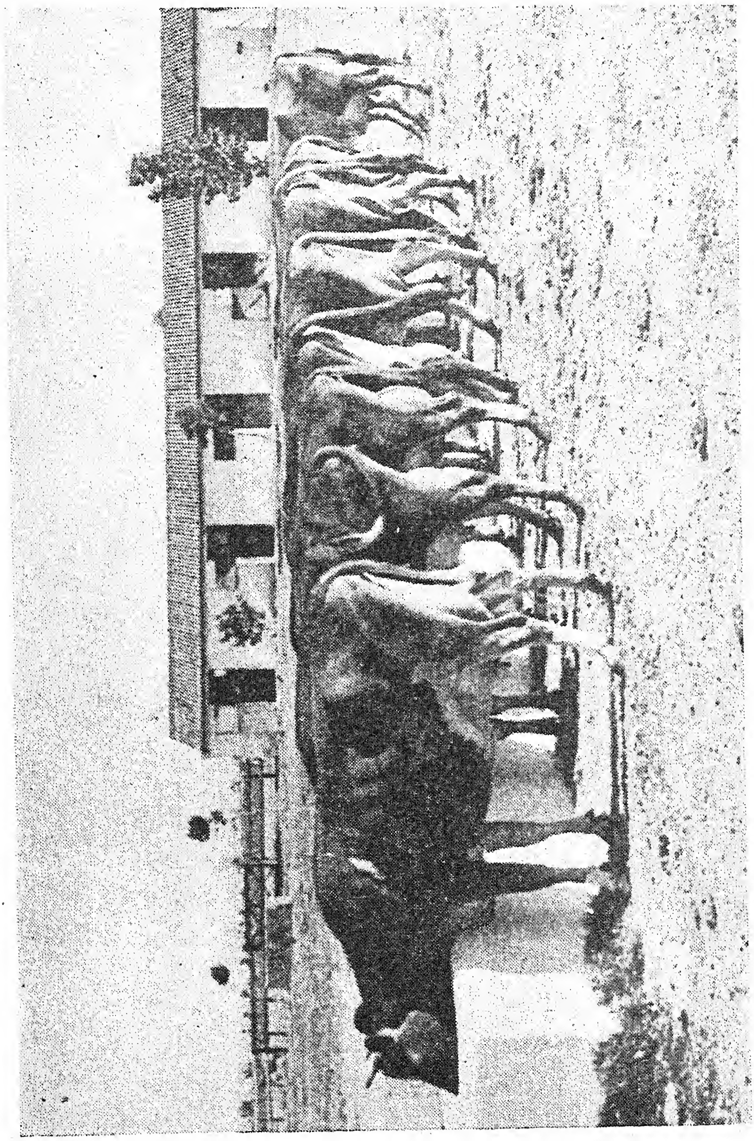
Dairy cows fed on dry hay, with no free access to water, frequently develop digestive disturbances.

Hay alone cannot fulfil the requirements of good cows. For this reason silage, which increases the digestibility of hay and at the same time contains vitamin A, should also be provided.

The quantity and nature of the concentrate fed, depends on the type and quality of hay.

Feed as much hay as the cow will eat in a day, i.e. approximately 2 to $2\frac{1}{2}$ lb. of hay for every 100 lb. live weight or 1 to $1\frac{1}{2}$ lb. of hay plus 3 lb. silage for every 100 lb. live weight.

Fig. 7.—Cows in Milk Must Always have Free Access to Water.



Water promotes the effectiveness of feed utilization and to a large extent, prevents digestive disturbances.

High-producing cows are the greatest water-drinkers.

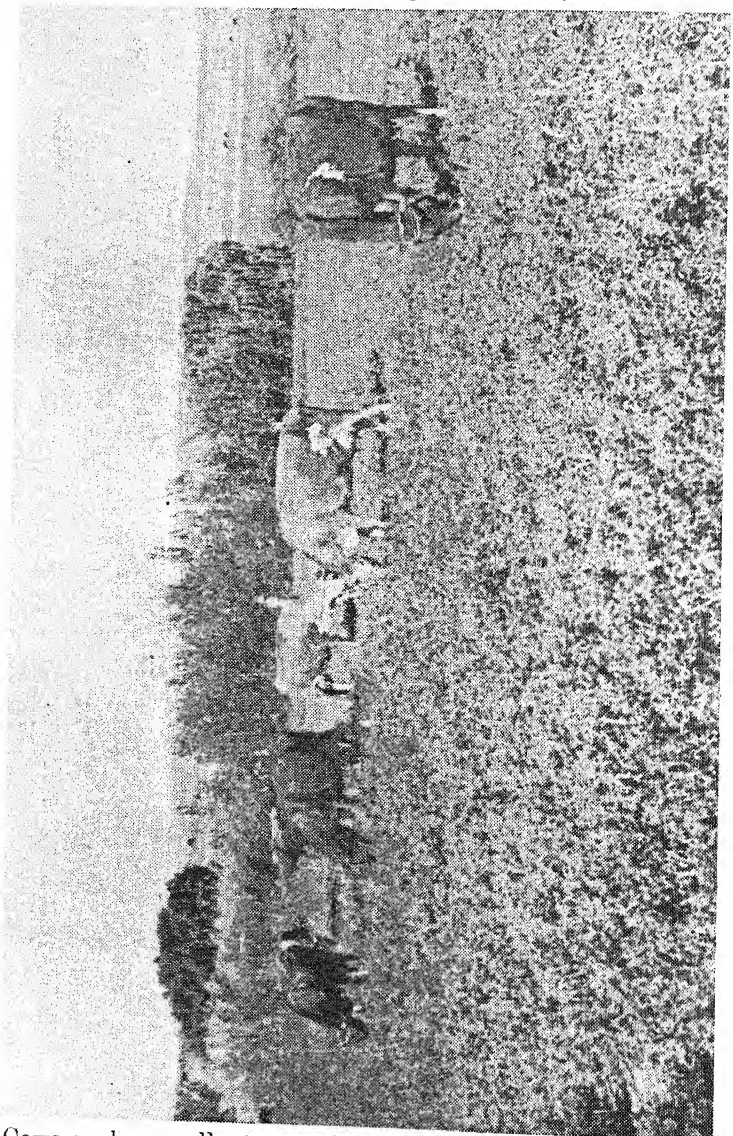
Cows drink approximately 4 gallons of water for every gallon of milk they produce.

Cows with free access to water drink more than those receiving water two or three times per day.

Experiments carried out with dairy cows showed that cows which have free access to water produce 7 per cent. more milk and 6 per cent. more butterfat, and drink 8 per cent. more water than cows which receive water two to three times per day.

The water must be clean. Dirty water can be the cause of internal parasite infestation.

Fig. 8.—Cows on Grazing under Irrigation.

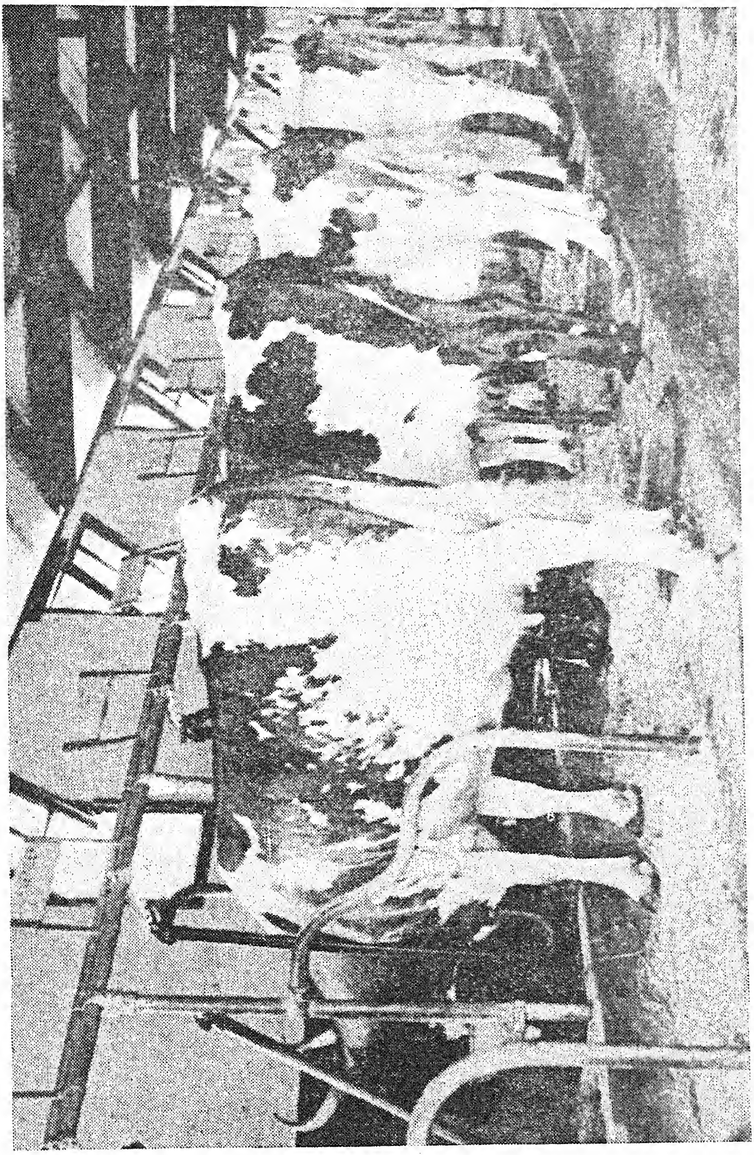


Cows make excellent use of grazing under irrigation; as much as 3 to 5 gallons of milk can be produced on such grazing without the aid of supplementary feed.

In areas where winter cereals can be cultivated, farmers are advised to make more use of these crops for the feeding of dairy cows.

Winter cereals are an even better and cheaper source of succulent feed than silage.

Fig. 9.—Good Cows in a Clean, Well Ventilated Stable.

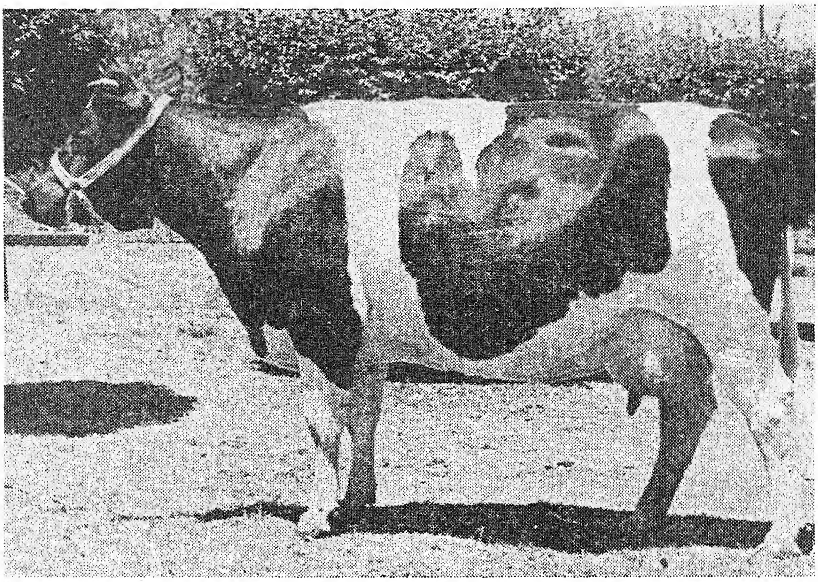


Do not milk cows in a dirty stable, and do not feed them anything with a strong odour just before milking.

Experiments have proved that strong odours such as that of silage, inhaled by the cows, can be detected in the milk within ten minutes. The milk itself will not, however, readily absorb the odour.

For every gallon of milk produced, cows should receive approximately $3\frac{1}{2}$ lb. of concentrates before milking.

Fig. 12.—A Well-fed Dairy Cow.

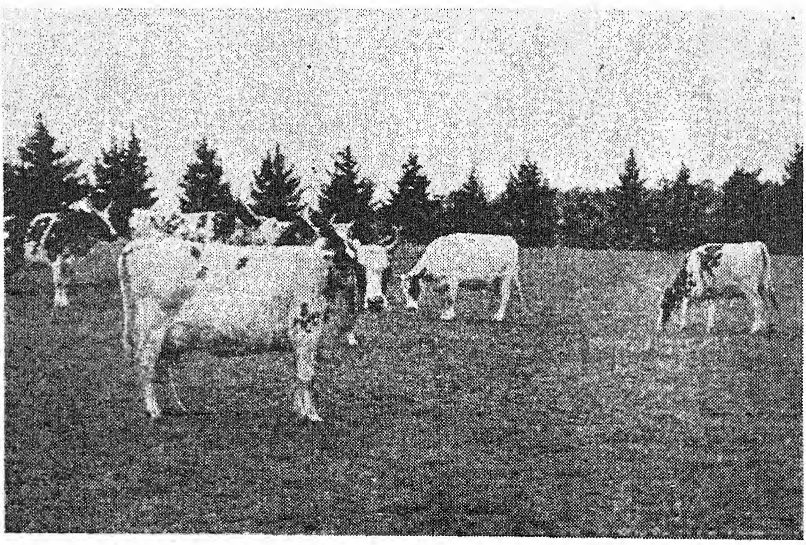


The milk production, fertility, health and longevity of dairy cows largely depend on good herd management and effective feeding.

The prevention of disease through good feeding and management, is more important than the treatment of sick animals.

Good feeding and care will do more to build up a healthy herd, than any amount of curative veterinary services.

Fig. 13.—A Group of Promising Young Cows.



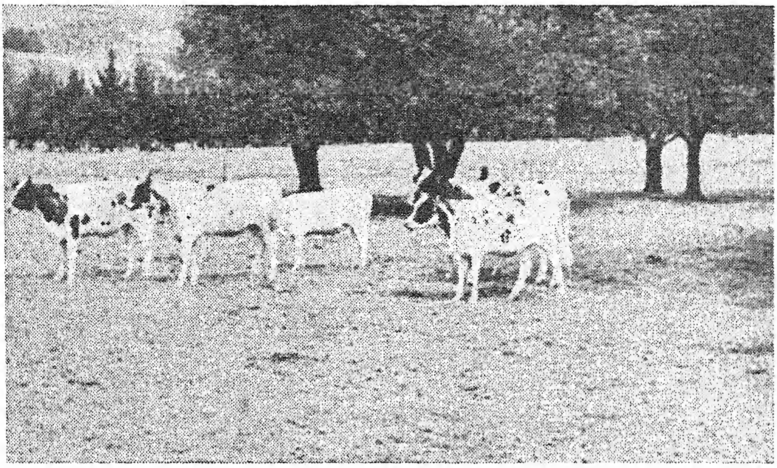
As a rule, well-fed heifers grow better and develop into better producers than poorly fed animals.

Well-grown Friesland heifers may calve at the age of 2 to $2\frac{1}{2}$ years, Ayrshires 3 months earlier and Jerseys often calve at the age of 21 to 24 months.

Rapid growth and calving when still young stimulates the growth of udder tissue, which promotes milk production and increases fertility.

Good grazing during the summer months and plenty of hay and silage during the winter months promotes the development of stomach capacity in heifers. Young heifers from 1 to 2 years of age, should receive 3 to 6 lb. of concentrates per day.

Fig. 14.—A Number of Well-Grown Young Heifers.



High fertility in dairy cows can be achieved by good feeding, rapid growth and breeding at an early age. Well-fed heifers usually become better producers than poorly fed animals.

Young heifers must receive good quality hay or good grazing to supply them with sufficient energy, and to develop their stomach capacity.

To ensure rapid growth, heifers must receive an ample supply of protein. Good quality legume hay or concentrates will fulfill these requirements.

Heifers from the age of one to two years will consume on an average 10 to 18 lb. of good hay and approximately 3 to 6 lb. of concentrates per day.

Danger of Trees and Shrubs on Earthen Embankments.

J. J. O. Pazzi, Senior Engineer, Division of Soil Conservation and Extension.

NUMEROUS farm dams and other earth banks have been built since the introduction of the water-conservation and soil-erosion control schemes and it may be assumed that the conservation campaign has not yet reached its peak, since the number of dams and other earthen structures completed every year is still increasing. It may also be assumed, however, that some of the first dams, completed about ten to twelve years ago, have become unserviceable and are in need of repair.

Why have these dams fallen into disrepair? Apart from unavoidable circumstances, we often find cases where dam walls or earth banks have been completely or partially destroyed as a result of carelessness. We usually find that during the first year or two a careful watch is kept over these structures, but that both interest and watchfulness wane after the walls have been successfully subjected to a few severe tests. Except in the case of gradual sinking or trampling or caving in as a result of spillway erosion, trees and shrubs growing on dam walls are responsible for unexpected disasters.

Let us examine briefly how trees and shrubs can be the cause of such unpleasant surprises.

As trees on banks increase in age and size and are subjected to greater wind-pressure on these exposed spots, the danger of their falling also increases, especially after soaking rains. The roots often penetrate almost as far as the water in the dam and when such roots are torn out when the tree falls, the water can easily filter through the small tunnels formed in this way. After filtering in, the water begins to seep through, forms a trickle and, before long, causes a breach in the wall.

The same results can be expected when trees on dam walls die. The roots will gradually rot away, leaving small tunnels through which water can easily penetrate.

Apart from the abovementioned factors, there are others which may have the same results.

In the course of time, old leaves, twigs and seeds collect under the trees and attract insects and rodents. Among these insects we find that anti-waste army, viz. the termites, fired with the one purpose of storing underground all obtainable plant refuse. Their small passages easily develop into channels which lead to breaches in the walls. The humus layer under the trees will also attract other insects and beetles and these, in turn, attract insect-eating animals. Mole-holes, e.g., make even better canals than termite tunnels and once the water has penetrated through these channels, the leak rapidly develops into a breach.

If, in addition to trees, there are other shrubs and/or bushes on the earth bank, the safety of the wall is still more seriously threatened. Offering perfect safety from hawks and owls, the ground where these shrubs grow, is infested with various rodents, digging and forming tunnels which will be far advanced before they become noticeable to the human eye, except under careful examination. Even fairly large tunnels such as those made by springhares and meercats, etc., often remain unnoticed.

Since practically all earth banks erected for the control and/or utilization of flood water, are in disuse during the greater portion

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Berry Culture.

H. B. Terry, Professional Officer, Division of Horticulture.

THE needs of manufacturers have hitherto to a great extent been met by the importation of berry pulp, but with the development of local industries and the expansion of South African markets, the production of large quantities of berry fruits for local canning and preserving companies has become very necessary. All these berry fruits have proved themselves adaptable to the varying

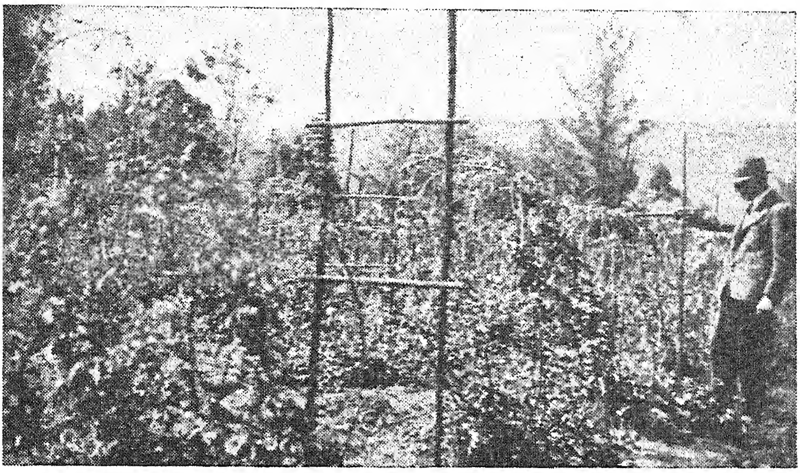

Fig. 1.—Youngberries trained on 2 wires on T-piece with lower wire 3 feet from ground. The supporting framework held by the man in the photo is intended to take the weight off the wires when carrying a heavy crop.

climatic and soil conditions of the Union, though care is necessary in the selection of areas for extensive commercial plantings. Berry fruits are among the most perishable products in cultivation and must be marketed more expeditiously then peaches or other soft fruits; fortunately, however, these berries can without fear of deterioration be transported in large containers for preserving, but for use in the fresh state, careful handling, packing and rapid transport are essential.

Since the berry crops ripen over a comparatively short season, several factors will determine the success or failure of the grower to produce heavy crops, chief among these being the initial preparation of the soil, proximity to markets or rail with good service, availability of labour for picking, a dependable water supply, the provision of support for the vines and the selection of varieties to extend the period of production.

Climatic conditions do not appear to restrict the growing of these trailing berry plants, though the plants do indicate a preference for areas where frosts are not too severe and the summer season not subject to abnormally heavy rainfall. The Coastal Belt and the Transvaal Bushveld or middle-veld areas have proved particularly suitable.

As regards soil, it may be said that the plants are not too particular. They thrive on a wide range of soils varying from sandy loam to clay loam, but as the plants are fairly deep-rooted, good

depth and drainage are essential. The preparation of the soil, and also the manuring of the holes in which the plants are to grow, should be as thorough as possible. A plentiful supply of well-rotted kraal manure to which a quantity of superphosphate has been added stimulates strong growth and ensures heavy crops of large berries. Generally, an annual application of 20 tons of old kraal manure, plus 600 lb. of superphosphate per morgen, worked into the soil

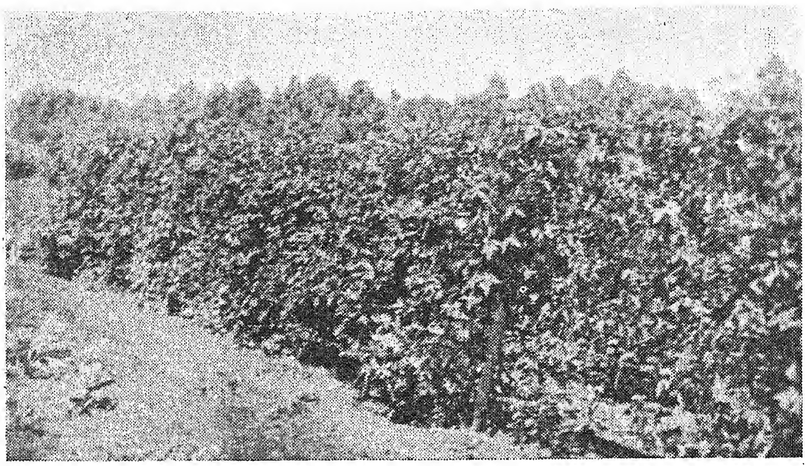

FIG. 2.—Youngberries trained on single wires, one above the other; no supports between poles.

during late winter, after the vines have been fastened to their supports, should assist in keeping the plants in production for 10 to 12 years. (This quantity of manure and fertilizer is equivalent to 5 lb. kraal manure and one ounce superphosphate per square yard.) The excessive use of fertilizers containing readily available nitrogen is not recommended, as they may produce soft fruits which are not easily transported.

Planting is done from June to August, according to climatic conditions, the rows being spaced 8 feet apart and the plants 8 to 10 feet apart in the rows. Having marked off the positions for the plants, dig the holes 2 feet square and 2 feet deep, keeping the subsoil separate from the top; loosen the soil in the bottom of each hole and, when replacing the top-soil in the hole, mix in one 4-gallon petrol tinful of old kraal manure and a handful of superphosphate. Fill up the hole again by scraping in top-soil from the surrounding soil, give water to settle the soil, and, when planting, spread another handful of superphosphpate in the soil about the roots. It is not necessary to press the soil firmly about the roots, since the watering will do this sufficiently. The crowns are usually placed 3 inches under the surface.

As maximum yields can only be expected from plants that are provided with suitable support and systematically pruned after fruiting, *trellising and pruning* are of the utmost importance.

Trellising.

The trellis to support the vines should be strong enough to carry the weight of fruit, and, as picking is tedious work and may entail some stooping to reach fruits near the ground, it should be high

enough to carry the bulk of the bearing surface of the vines. A serviceable trellis is constructed by firmly fixing 3-inch poles at each end of a row at intervals of about 24 feet in the row so as to stand $4\frac{1}{2}$ feet above the ground; then at the top of each pole is fastened a 2-foot horizontal cross-piece to form a T-piece to which stout wires are fixed to support the vines, whilst a single wire should be fastened 3 feet from the ground to assist in carrying the

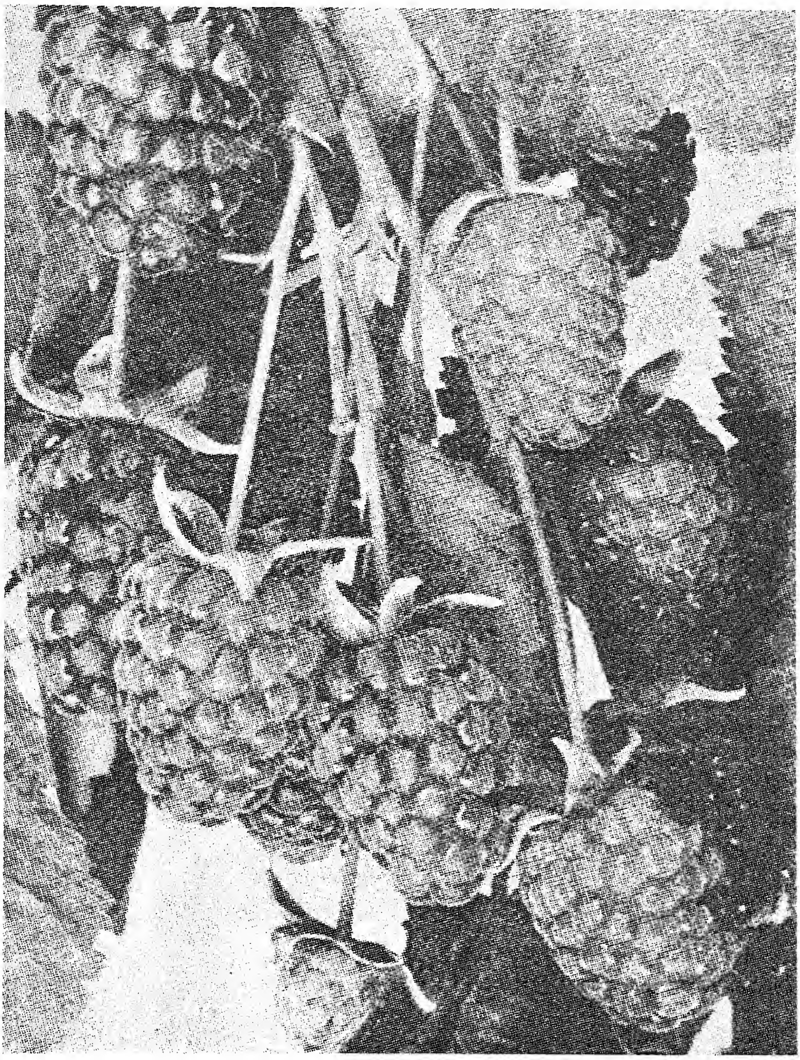

FIG. 3.—Loganberries.

growths. Another method which has proved successful, is to use a two-wire trellis, the lower wire being fixed to the poles 3 feet from the ground, and another wire $1\frac{1}{2}$ feet higher; the vines are then woven and spaced around both wires in a loose spiral formation. Number 14-gauge wire is required to support the heavy growths on the trellis.

Pruning.

Since these trailing kinds of berry plants produce their fruit on the previous season's vines, pruning cannot be neglected for a single season. The new growths which arise from the crown of the plant are allowed to lie on the ground under the row during early summer; after the fruit has been gathered from the vines on the trellis, *these are cut away at their bases during December or January* to make room for the new vines lying on the ground. Where the new growths are too crowded, weak vines should be thinned out when lifting them up for tying over the trellis during early winter.

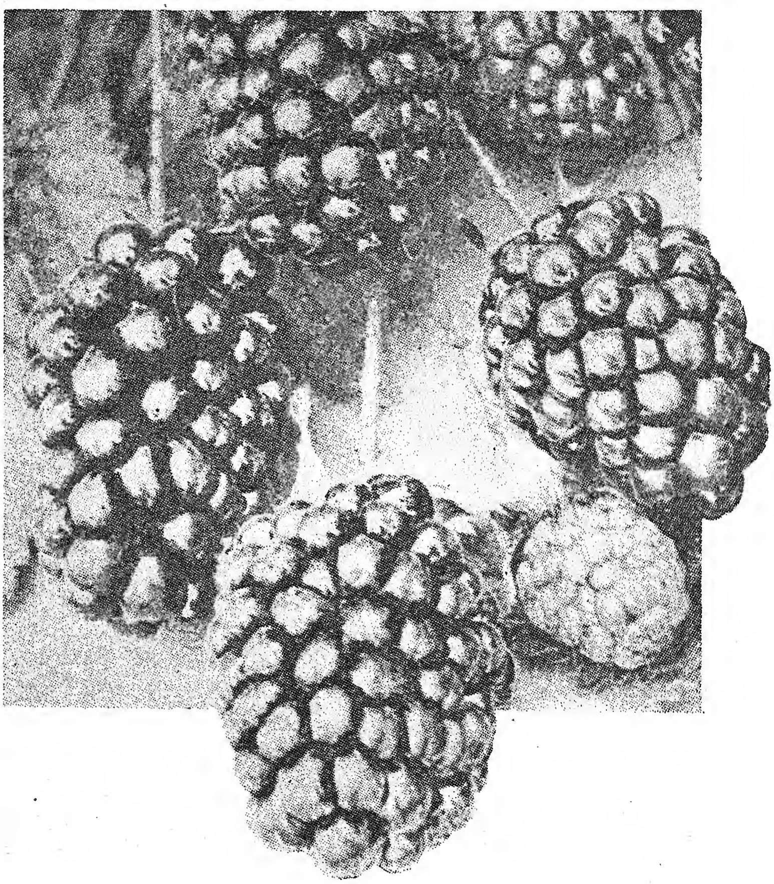

FIG. 4.—Booysenberries—natural size.

Harvesting and Yields.

The perishable nature of the fruit calls for close attention to picking. During the early stages of ripening, the fruits should be picked off every second or third day, but when uniform ripening begins, the crop must be gathered every day. Since there is no need to grade the berries, they should be picked directly into the punnets or containers in which they are to be sold. A commercial crop is harvested in the second growing season after planting, and yields vary according to the quality of the soil preparation and manuring. At each bud the vines develop a spray of blossoms

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The Horse on the Farm.

V (b). Feeding and Management of Stallion, Mare and Foal.

Dr. P. J. v.d. H. Schreuder and F. B. Wright, Senior Professional Officers (Horses).

IN the previous section* a general outline was given of the feeding and management of horses, but as success is due mainly to the attention and treatment of individuals or classes of horses, the following chapter will deal with the treatment of these in greater detail.

The Draught Stallion.

The draught stallion should be very muscular, powerful, low-set, blocky and compact. Breed character and masculinity should be evident in a clean-cut face and head, and powerful and well-arched

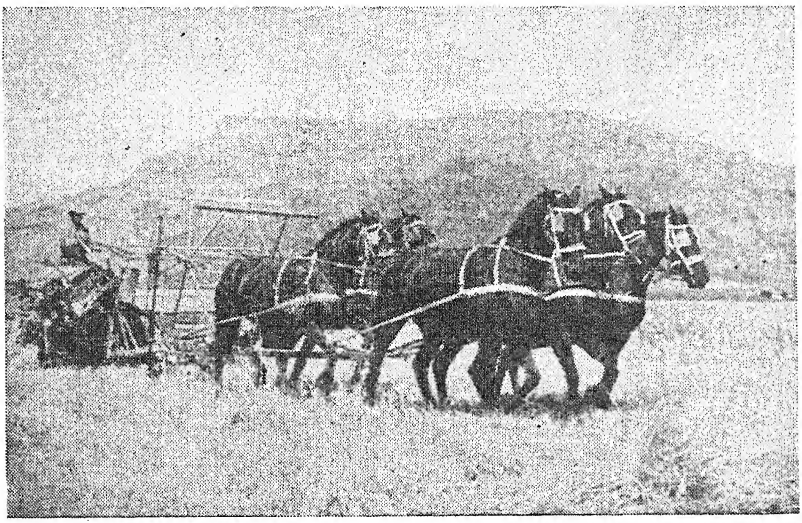

Fig. 1.—Light Boland mares mowing a good wheat crop in the Western Cape Province.

neck. He must look the part of a vigorous male; a stallion that resembles a mare or gelding in certain features is not likely to prove a good sire. Good action and style are important attributes. He must be free from hereditary unsoundness. Quality and soundness of feet and limbs must be superior and must not be sacrificed for other features—even size and weight which are very desirable. A stallion's progeny, of course, furnish very useful proof of his ability to reproduce himself and the highest sum total of characteristics of his type and breed. One should also secure evidence of the fertility of a mature stallion offered for sale.

The pedigree and individual merits of the parents and family of a young stallion must be carefully examined in order to minimize the uncertainty of his ultimate development and breeding ability.

* See March 1947 issue of *Farming in South Africa*.

Feeding and Grooming.

The owner of a valuable stallion should on personal inspection or that of a reliable deputy make sure that only the choicest and soundest feeds are fed to the animal at regular times and in correct amounts. The main concentrate must be rolled oats with small additions of bran, barley and peanut meal, along with choice lucerne hay. Maize is a risky feed for stud stallions. Clean pasture grass and carrots are valuable aids in promoting health and fitness. The following concentrate mixture is recommended:—

Rolled oats	50 parts by weight.
Wheaten bran	25 ,, ,, ,,
Barley	20 ,, ,, ,,
Peanut meal	5 ,, ,, ,,

In addition, about 10 to 15 lb. of lucerne and teff hay (half and half) should be given.

The amount of concentrates fed per day will vary according to the condition and amount of service done during the breeding season. Great care should be taken never to allow the stallion to put on extreme weight as this is most harmful in a animal intended for the show ring. Rather let the stallion start the breeding season in a thrifty condition and increase his weight during the season. Draught stallions in good condition during the off season will do well on 10 to 15 lb. of the above mixture. With choice hay and a small ration of carrots, even less grain may be advisable to prevent an overfat condition. Mature stallions should not be allowed to exceed 2,000 lb. in weight, 1,950 lb. being more comfortable and safe.

A valuable stallion is worthy of reliable and expert attention. He should be thoroughly groomed in the morning at 5.30 to 6 a.m. and fed a portion of the day's concentrate ration. At 9 a.m. he is fed some hay, grain again at noon, hay at 3 p.m., and the last of the day's grain at 5 p.m. If not worked, he need only be watered at 10 a.m. and again at 4 p.m. A bran mash should be fed at least once a week. Mix 3 lb. rolled oats, 2 lb. bran, 1 lb. barley and two ounces of Epsom salts with water into a crumbly—not wet—condition, and feed this instead of the evening's concentrate feed.

One ounce of calcium carbonate per day should be mixed with one of the day's concentrate feeds, or mix 3 per cent. fine bone meal with the concentrate mixture.

It is most desirable to work the stallion. It keeps him healthy and virile and more contented. He can be used to do practically all of the farmyard routine work and other chores. Either a light four-wheeler trolley or pneumatic tyred cart could be used. During cool weather and the off season he could even take his place in a team.

If the stallion is not worked, he must be given ample exercise in a safe yard, or walked or ridden at least two miles daily.

At night he should be bedded liberally with wheat straw or chopped veld grass free from ticks. The bedding should be sun-dried daily, and the stall washed and disinfected weekly. Cleanliness promotes comfort and health. The stable should preferably have access to the exercise yard—50 yds. long and about 10 yds. wide or even more. A stallion should never be isolated or locked up, but allowed to see and hear all that is going on around him, for then he will be less likely to contract bad habits and vices.

In the stable he should be protected against flies and other noxious insects. The stable may be darkened and fly sprays used. A good fly repellent spray is made up of 100 parts fish oil, 50 parts oil of tar and 1 part of crude carbolic acid, and may be used on stabled horses and colts and mares in paddocks. Apply the spray with an ordinary fly spray or spongy rags.

Fig. 2.—The oat-hay crop being harvested.

Shady trees or cheap sheds are very desirable during extreme summer heat. Thorough grooming adds to a horse's comfort and health since it stimulates the action of the skin glands, oils the hair, increases the blood supply to the skin and acts as a tonic to the whole body. A good stiff dandy brush followed by a softer body brush will remove all dandruff and dirt. The currycomb is only used to clean up the brushes or clotted sweat or dirt on the body. After a thorough brushing a soft and slightly damp cloth may be used for a final wiping, the eyes, ears and nostrils being cleaned with a wet cloth.

The feet must be cleaned every morning and painted weekly with a mixture of 10 parts of fish oil and 1 part stockholm tar. Every month or six weeks the feet should be carefully trimmed, and shoeing may be avoided unless this is necessary for show purposes.

The Draught Mare.

The draught mare should be of desirable draught conformation, matronly, and of quiet but active disposition. She should be free from hereditary unsoundnesses, possess breed characteristics in a high degree, and come from a family of regular breeders with profitable utility attributes, and longevity, willingness to work, good temperament, good quality bone and good feet.

Draught mares are generally regular breeders when they are worked regularly and reasonably. Idle mares are unduly expensive and often not regular breeders. Most mares will work moderately

and to their benefit right up to foaling time. About six weeks before foaling the mare should only be used for light work; over-exertion, jerks and bumps must be avoided. Her ration should from now on contain at least 2 to 3 lb. bran a day. If not worked, the mare heavy in foal should be forced to take exercise as she is prone to stand about at this time. After foaling she could be relieved by dry mares or three-year-olds for the first three weeks at least, after which she can return to regular work.

Draught mares are usually bred when they are three years old if well developed and sound in all respects. Fillies should be trained to harness some time prior to the beginning of the season and rested for a while after service. Fillies normally come on heat at 15 to 24 months of age, the period lasting 3 to 7 days. The undesirable practice of running the stallion or colts with the troop, resulting in the foaling of fillies at too tender an age, is as serious a cause of arresting growth and development in our horses as is the lack of a sufficient food supply, and as that cause is preventable it is of the utmost importance not to permit stallions or colts of serviceable age (18-24 months) to run with the troop of mares and fillies. The stud stallion must at all times be under full control and in hand.

The Foal.

A good safe, clean foaling paddock is most often the best if weather conditions permit. The paddocks should be vacated when the foals are old enough (30-60 days) to join others in a larger camp.

Although good foaling paddocks are provided for, it is highly desirable to have a good foaling box to use in case of abnormal births or severe weather conditions.

This box should be about 16 feet by 16 feet with a high manger and no other obstructions. It should be spotlessly cleaned by thorough disinfection and scrubbing of the floors, manger and walls. Here the mare must be well bedded down at night with clean fresh straw, and have the run of a small, clean, well-shaded paddock during the day, if the weather permits.

The foaling paddocks should be contiguous, allowing only one mare per paddock a month prior to foaling and a month after foaling. New-born foals run great risk of being kicked to death by other horses. Brood mares with foals at foot should be run together only if friendly and well behaved, when the foals are about a month old. They should never be run in camps containing other stock, and least of all with mules that may worry the foals to death.

Foaling mares should not be run with barren mares that are apt to tease and even kick. Foaling mares are more sedate and can be run together up to a month before foaling. Some institutions groom foaling mares regularly, while others only keep mares' tails, fore-tops, feet and legs tidy and clean. Just prior to foaling, 8 to 10 inches of the tails (docks) may be clipped or bandaged for the sake of cleanliness.

In order to secure a good foal crop and to retain mares as regular breeders, they should be kept in a thrifty, moderate, condition throughout the year, whether worked or idle. Mares should not be permitted to go down in condition after the nursing period. During their dry period they should receive such feeding and care that they will be in a fit condition for foaling and nursing. If they are worked

when in foal or suckling a foal, they will, of course, receive work-horse rations, but even then a little additional feed will be necessary.

Dry mares should run on good pastures supplemented with good roughage, a third of which must be a legume hay, and even some grain if the winter is severe.

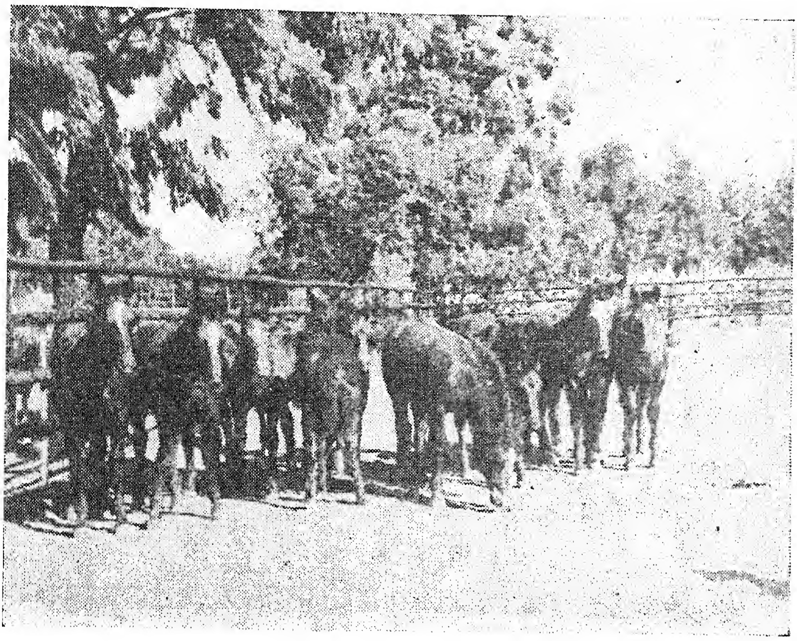

FIG. 3.—While the mothers are at work, these weanlings are safe in a shady and well constructed paddock with wooden rails.

In working mares with foals at foot, care should be taken against over-working, over-exertion and over-heating. The foals, which are either locked in a large barn or stall or placed in a safe wooden-railed paddock, should have access to their dams only when the mares are thoroughly cooled off, and even then it is advisable to draw a little milk from each teat before permitting the foals to suckle.

Care of the Foal.

The pregnant mare in her paddock should be unobtrusively watched daily. The foaling date in a well-regulated stud will be known, but even so mares may be early or late by a few days to three weeks. Fulness of the udder, wax on the teats and a marked sinking of the croup muscles are signs that foaling is about due. The feeding now should be light, laxative and moderate in amount and bulkiness.

Shortly before foaling, the mare becomes restless. Lying down and rising frequently, sweating and frequent urination are indications of approaching parturition. The normal presentation is the front feet followed by the nose. Healthy vigorous mares usually foal within 15 minutes. Any other presentation may cause delay in foaling and smother the foal. With prompt assistance the life of the foal may be saved.

Respiration in such an assisted foal is often aided by artificial respiration and the prompt removal of the mucus film from nostrils and mouth.

The navel cord usually breaks near the body; if it does not, it can be severed by scraping it with a disinfected knife or blunt shears. The navel, feet and nostrils should be painted immediately after birth with a 10 per cent. solution of iodine (the treatment being repeated after a few hours) and then dusted with a good antiseptic drying powder. Continue this treatment for the next few days until the stump is dry and healed.

If all goes well, the mare should be permitted to rest for a few hours after having had a bran mash and a light drink. The afterbirth should be discharged within 2 hours and must be buried or burned. A difficult birth that causes bruising or retention of the afterbirth should receive immediate veterinary attention. Temperature after parturition will indicate the return to a normal condition and should read about 101° F.

The new-born foal should be on its feet and nurse within half an hour or earlier, and in the case of awkward or weakish foals guidance should be given. Make sure that the foal's bowels act within a few hours; if they do not, a lukewarm water enema containing a little glycerin or raw linseed oil may be administered. In severer cases of constipation a dose of an ounce of castor oil mixed with the dam's milk should be given.

If there is no elimination of the meconium in a new-born foal within 12 hours, an enema of lukewarm olive oil or a rectal douche of lukewarm soapy water must be administered. Do not let dams nurse their foals when they return hot from work or excited after service, since diarrhoea or scours may result. The mare should be milked a little and the foal made to wait for a fresh supply of milk.

In the case of diarrhoea, often caused by too much milk, cut down the mare's ration severely and even handmilk her several times a day.

If prior to foaling, a mare is properly fed a ration containing a laxative foodstuff, her first milk will contain Nature's laxative for the foal.

The most dreaded foal disease is navel or joint ill. Its origins often lie to a large extent in unsanitary conditions of the stallion and mare at breeding time and may be prevented by the strictest sanitary and hygienic practices.

The young foal should be handled often so as to be on friendly terms with the grooms. The feet and legs are often handled so that half his training is done at weaning, and "breaking in" later is obviated. The feet should be cared for regularly. Serious defects of feet and legs can often be prevented. Adjustments can be made to incorrect placement by suitable shoeing or other means. The observant horseman, assisted by a skilful farrier, can do a great deal towards preventing unsoundnesses of feet and legs.

The Orphan Foal.

If an orphaned foal cannot be nursed by another mare, milk from a cow with a low butterfat test must be used. Mix into a pint of this milk 3 to 5 tablespoonfuls of limewater and one tablespoonful of sugar. Warm the milk to body heat and feed a ¼ pint every hour

for the first few days. Increase this amount as the foal grows. After a month the sugar can be omitted and within six weeks skimmilk can be used entirely. At this time the foal must be coaxed to take concentrate feed and hay. Raising an orphan foal is a task calling for perseverance, punctuality and cleanliness. Good orphan foals are fine pets and can be developed into very useful animals.

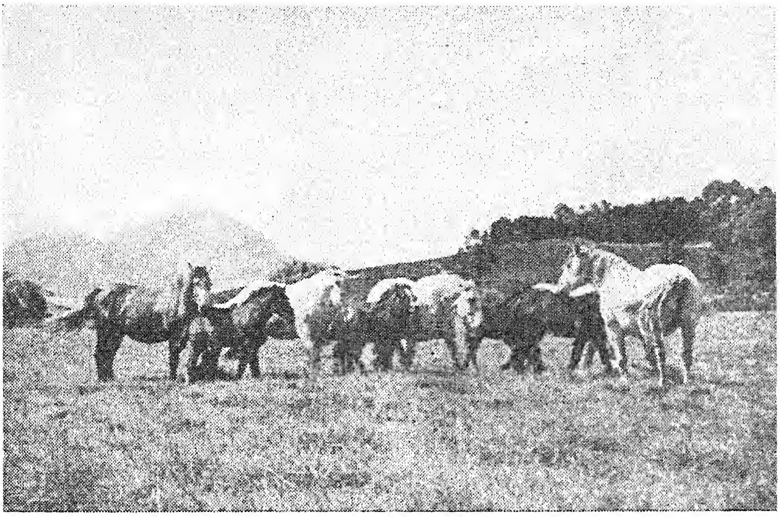

FIG. 4.—Stud mares and foals in a safe paddock with good grazing.

Weaners.

Foals should be accustomed to eating grain and hay before they are weaned at the age of six months. If their dams are worked and they are stalled or placed in a safe paddock, they should be provided with small amounts of their dam's ration—grain and hay. If mares are idle and pastures good, very little, if any, additional feed is necessary; but such conditions do not obtain for long in any part of South Africa and to assure full development additional feed is always beneficial and profitable.

It is desirable to wean foals in a bunch or in pairs for company and better behaviour. If they are weaned singly, it is best to run a few quiet barren mares with them and their dams so that when the dams are removed they have company. Some mares are often good milkers and their udders must be stripped two or three times a day to prevent discomfort or more serious trouble. Since foals are practically independent of their dams at weaning time, they can be left for a while in the paddock they are accustomed to. The foal of a blind mare is belled when she is suckling it.

Yearlings.

In developing yearlings for the show or sale, they must display their best form and must be fed regularly but moderately. Over-feeding is as harmful as under-feeding. It is a very bad practice to neglect weaners and then force them as yearlings, since puffy hocks and knuckling at the fetlocks often result.

Both the weaner and yearling must be protected against internal parasites. Foals and weaners should be freed of ticks every day (or at least once a week) and groomed thoroughly.

If foals, or other horses for that matter, rub the hair out of tails or manes, these parts should be washed thoroughly with soap and water and a soothing ointment of lard and sulphur applied. Melt the lard and add as much sulphur as it would take to make a stiffish salve.

Clean pastures, clean stables and a fresh, clean water supply are effective aids in parasite control.

Draught-horse colts and fillies make about 50 per cent. of their mature weight during the first year, and it is therefore of the utmost importance to provide all the necessary facilities for feeding and care during this vital period. Heavy grain feeding is not necessary; in fact, it is even dangerous for it produces an excessive condition at greater expense and entails risks of unsoundness and bad health. A combination of roughages—good lucerne hay, sheaf oats and sweet-grass hay—when pastures are good, will give good results. Additional grain feed consisting of oats and crushed maize, half and half, should supplement grazing and roughage when either or both sources of feed are not of the best.

The observant and experienced horseman will watch development and condition, and feed accordingly. The following average weights of draught horses will guide the breeder:—at birth, 130 lb.; at 12 months, 1,000 lb.; at 24 months, 1,400 lb.; at 36 months, 1,700 lb.; at 48 months, 1,900 lb.

Training of Young Horses.

The training of colts should begin at an early age. In handling the new-born foal for disinfection purposes, put the arms round the chest and buttocks. Never handle the neck or legs at this age. Keep on handling the foal frequently. A sugar lump establishes cupboard love and foals soon come up when called. Foals handled often and kindly have less fear of man and are approachable in pasture or stall. Grooms must be kind but firm. Obedience to certain commands must be taught in a coaxing and friendly way rather than with harsh shouting and coarse handling or whipping. A leather halter with broadish neck band is put on at an early date and the foal is handled for a few moments each day. Do this preferably in the exercise yard where injury from manger and walls is not possible.

Teach the foal to lead with its mother for a day or two and then to lead at a walk and trot without its mother. Teach him to start and to stop and to stand squarely with head up, but teach him only one thing at a time. All lessons later on should be of short duration and oft repeated. Handle feet and legs frequently. Tough, strong, well-shaped feet and pasterns are in a large measure the result of proper and timely care given to the foal's feet. The wearing may be uneven and the placement of feet and pasterns may be permanently affected. The feet should be examined at least once a month and be trimmed, if necessary, to bring equal bearing and wearing on all parts of the wall of the foot.

Pure-bred, registered colts are usually prepared for sale at two years of age. They are taken in hand as yearlings and taught good manners, obedience and attentiveness. If foals are handled daily from birth onwards, half the task is done. When one has to deal with colts left untouched until three, one marvels at the gentleness of colts handled from foalhood. These strong youngsters can be veritable beasts, and the " breaking in " is often dangerous and painful.

Well-developed two-year-olds can be trained to harness and do a little light work, but it is preferable to start serious training and use at three.

The colt used to handling is a simple proposition. He is harnessed and led about—one groom at the head and another at the reins. He is first accustomed to bit and rein, and to obey certain commands. He is then coupled to an older and steady horse and again the pair make several rounds. When the preliminary lessons have been learned and his behaviour is exemplary, the pair can be hitched to a light wagon with good brakes. For the first few moments a groom could be at his head and talk to him encouragingly. Whipping, shouting and any strange handling that may excite the colt should be strictly avoided. The groom, if not the trainer, should be present throughout the training process. The restraining and encouraging influence of a known voice from a person who has always been kind, is very helpful indeed.

Training veld-reared colts is a proposition calling for experience, great patience, kindness and strength. The colt's " mind " must be disabused of fear. Even in the roughest but necessarily firm handling he must be talked to kindly and patted. As soon as he is in hand, he should be joined by an older, quiet and gentle horse he knows. Often it is desirable to let him go for a day or so with the halter on to accustom him to the feel and smell of it.

Once he has learned to walk around coupled to the older horse, he can be harnessed and again taught to make rounds with the harness on. Once he is accustomed to the harness and other things about his body and legs, the pair may be hitched to a light wagon. None of these processes should be overdone, least of all the first pull in harness. The preliminary lessons are best given in a large kraal or wooden-railed exercise yard.

A horse-breeding proposition of any pretention must provide a good horse crush leading off from a smaller kraal or paddock. The horse wanted is coaxed into this crush and safely secured. The crush is built like an ordinary cattle crush, only higher and closed in on top as well. From a V-shaped inlet the horse enters a crush made of stout, strong smooth poles, about three horse-lengths (25 feet) long, 30 inches wide and 8 feet high. A strong door entirely closes the exit; it is also barred and narrow enough (3-5 inches) to prevent the horse from putting its head through. The side rails of the crush should be 8 to 10 inches apart and supported every 3 feet by strong uprights. Such a crush is indispensable to the horse breeder and helps him to attend to his horses individually in dosing for worms, inoculation against horse-sickness and anthrax, taking blood tests for dourine or handling them for any necessary purpose.

The untrained youngster from the veld is secured here and coupled through the side of the door and door-post to the older horse outside the crush. Transverse posts are inserted behind the horse. When he has been captured in this section, allay his fears by every possible means—kind words, whistling and patting.

The crude method of securing a wild youngster with the choking lasso (vangstok) borders on the criminal and should not be used by a breeder of any standing, least of all by those who handle valuable horse stock where improved methods of management, treatment and care should be practised.

Never attempt to "break the spirit" of a very vigorous and spirited horse. The trainer should anticipate any emergency. Only strong ropes and harness should be used. Patience, kindness and skill should be the main attributes of the trainer. The short-tempered, cruel person should not be tolerated with livestock and least of all with horses.

Use three-year-olds lightly during late winter so as to harden them for work in early summer. The breeding season will call fillies to stud and the usual treatment should be given them during that period.

Berry Culture :—

[*Continued from page* 380.

similar to that of the well-known blackberry, and individual plants produce from 15 to 35 lb. of fruit per season. A good picker can easily pick up to 200 lb. of berries per day.

Kinds of Berry Fruits.

There are several kinds of trailing berry fruits which are being grown in various parts of the Union, and among these the following are considered worthy of further planting:—

(i) The *Youngberry* (the thornless variety being an improvement on the spiny one because of ease in handling), which produces large, firm, almost seedless fruits of a deep wine colour, changing to a jet black as they mature. The flavour is excellent.

(ii) The *Dewberry* which ripens a week or two earlier than the Youngberry. The fruits are fairly large, jet black and of good flavour.

(iii) The *Booysenberry* which produces large clusters of black fruits and ripens about two weeks later than the Youngberry.

(iv) The *Loganberry* of which there are both thornless and spiny varieties. They produce an abundance of large, long, dark red berries of good quality with a sub-acid flavour.

Thus, by planting a selection of these trailing berry fruits the production season can be profitably extended.

Annual fertilizing plus a plentiful supply of water at all times is essential for maintaining vigour and good crops.

Propagation.

Nearly all of the trailing varieties such as those under review are increased by layering. The method adopted is to cover the end of the growth with a spadeful of soil during the latter part of the summer. The point covered sends down roots and forms a plant which may be transplanted in spring.

Sex Identification in Chickens.

Prof. A. M. Gericke, Department of Poultry Husbandry, Agricultural Research Institute, Pretoria.

THE development of the poultry industry has created a large demand for female chickens. Most buyers of day-old chicks are not eager to purchase male chicks because by so doing they must provide about double the accommodation in rearing houses. In certain areas it is unremunerative to rear male chicks to the marketing stage and it is considered more profitable to kill the male chicks at day-old age. Male chicks grow more rapidly than females and therefore these can be raised more profitably at poultry plants catering for the

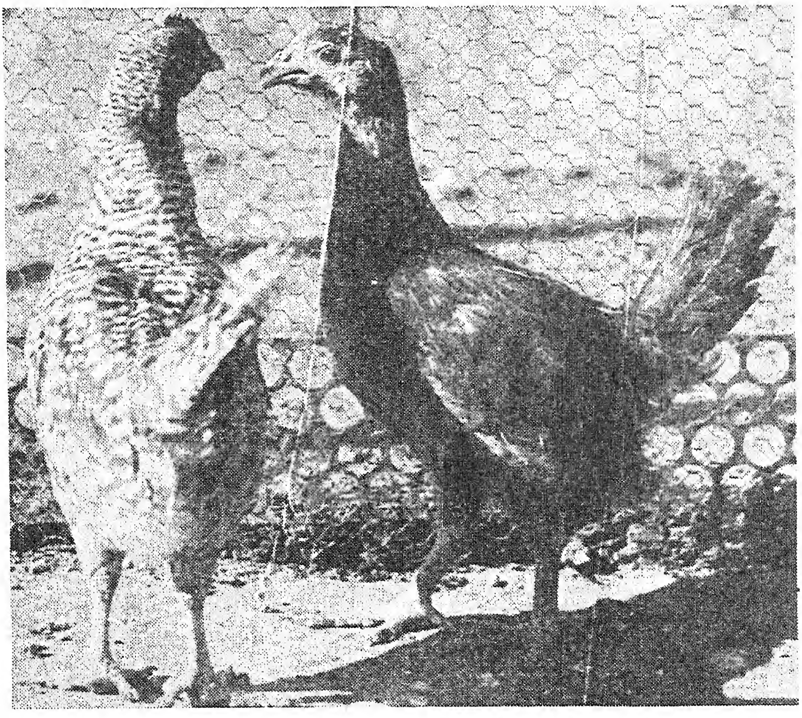

FIG. 1.—A dark coloured male when crossed with a Barred Plymouth Rock hen produces a dark pullet and a barred cockerel.

production of table birds. Males hatched from valuable strains are, of course, reared for breeding purposes.

Several methods of sex identification in day-old chicks have been investigated, sex-linkage being one of the first to be utilized on a commercial scale.

1. Sex-Linkage: Down-Colour Method.

In 1919 Professor Punnett published the results of several crosses in which the sex could be identified accurately by observations made of the down-colour at day-old age.

The inheritance of sex-linked characters is most interesting. In poultry the male has 17 pairs of ordinary chromosomes and 2 sex-chromosomes, whereas the female also has 17 pairs of ordinary

chromosomes but only one sex-chromosome. The inheritance of sex-characters in poultry is known as the WZ type—Z denoting the presence of the sex-chromosome and W the absence of the sex-chromosome. Because the female has only 1 sex-chromosome she is of the ZW type and the male with 2 sex-chromosomes is of the ZZ type.

It has been established that gold males and females are always pure for colour, but silver males may be pure or impure, whereas silver hens are always impure. In a cross between a gold male (ZZ), such as the Indian Game and Light Sussex females (ZW), silver male and gold female chicks are produced which can be distinguished accurately at day-old age.

Barring, as in the Barred Plymouth Rock, is also a typical sex-linked character. If a black cock is mated to a Barred Plymouth Rock hen, the progeny will all have black down, but the males will have a light spot on the head, while the females will be entirely black. As adults, the females are black and the males have the typical barred colour (Fig. 1). If the opposite cross is made (black hen mated to a Barred Plymouth Rock cock) the down colour of the chicks is not distinct, and as adults all the birds will be barred in colour. It is therefore obvious that a silver female, like the Barred Plymouth Rock, must be mated to a black cock for accurate sexing of the chicks at day-old age.

In the brochure "Sex-linked Crosses", which was published by The Feathered World, the following sex-linked crosses are suggested:

Gold and Silver Matings.

(A) Light Sussex hens crossed with males of any of the following breeds: Rhode Island Red, Brown Leghorn, Buff Rock, Buff Leghorn, Barnevelder, Marsh Daisy, Red Sussex, Brown Sussex, Buff Orpington and Welsummer.

(B) Columbian Wyandotte hens crossed with Rhode Island Red or Barnevelder cocks.

(C) White Wyandotte hens crossed with males of any of the following breeds: Rhode Island Red, Buff Rock, Brown Leghorn, Buff Leghorn and Old English Pheasant Fowl.

(D) Other Gold and Silver crosses: Brown Leghorn cock × Duckwing Leghorn hens, Gold Campine Cock × Silver Campine hens, Gold Laced Wyandotte cock × Silver Laced Wyandotte hens, Gold Laced or Pencilled Hamburg cock × Silver Laced or Pencilled Hamburg hens.

The disadvantage of sex-linked crosses is that both gold and silver breeds must be kept. The mating of crossbreds is not recommended because the sexes cannot be identified at day-old age and the adult birds will consist of a mixture of various sizes and plumage colours.

Sex Identification in Pure-bred Plymouth Rocks.

It is well-known that in this breed the shade of the feathers in hens is usually darker than in cocks. Quinn and Knox (1939) observed that the chief difference between male and female chicks consists in the intensity of the black pigment in the down and shank colours. Male chicks have silver and black heads, and females have white and black heads. Male chicks usually have larger head spots than females, and the colour is silvery white. In female chicks the head spots are usually smaller, with contrasting black and white in

the down of the head. Male chicks are silver gray, silver black or dull black on the back, and females are deep brilliant black. Both males and females may carry silver striping on the back. Male chicks are silver and white in the face and throat, and females are black with white spots. Male chicks are silver gray in the abdominal region, usually with 2 white spots, and females are dark ashy gray with 1 or 2 spots, black with white spots or entirely white. Male chicks have yellow, yellow-ringed or dusky yellow shanks, and females have black or dark shanks with the dark pigment usually broken off rather abruptly. Male chicks have yellow toes or yellow-ringed toes, and females have black or dark toes with yellow appearing at the extremities.

In the above investigation the accuracy in sex identification was from 83·5 to 91·8 per cent.

Jerome (1939) observed that in Barred Plymouth Rock chicks at day-old age the head spots of males are irregular in outline and scattered in appearance, while in females the head spots are more regular in outline. In sexing he obtained an accuracy of 90 per cent. or better when the head spots were considered, and 95 per cent. when the colour of the legs was included. Warren (1942) did not consider shank colour to be of value in sexing, because the colour is not sufficiently developed at hatching and sometimes the sexes can be distinguished only after they are a few weeks old.

There are several types of head spots in Barred Plymouth Rock male and female chicks, and the variation in the size and colour of head spots will probably influence the accuracy of sexing when chicks bred from different strains are examined.

2. Rate of Feather Development.

Warren (1942) stated that the more common breeds and varieties fall into two groups: the early and the late feathering. The terms early and late refer to the age at which the adult plumage begins to replace the chick down. Three methods are used to determine the rate of feathering: (*a*) the length of the primary feathers at day-old age, (*b*) the length of the tail feathers at 10 days of age, and (*c*) the feather growth over the back from 4 to 8 weeks of age. The primary and secondary wing feathers are the first to develop, being visible in some breeds at hatching. In studies of the rate of feathering, the age at which tail feathers appear has been found to be the most definite basis of classification. In early-feathering breeds the tail feathers appear at from 6 to 8 days of age, and in late feathering ones these feathers do not appear before the 20th day.

The White Leghorn has a dominant white colour and therefore this breed cannot be used in any cross to distinguish the sexes at day-old age by the down-colour method. Leghorns are rapid feathering, whereas most heavy breeds are classified as slow feathering. Slow feathering is sex-linked and dominant to rapid feathering. This is illustrated in the following matings:

When a White Leghorn male is mated to Jersey Giant females, all the female progeny will be quick feathering, while the males will be slow feathering. When a Jersey Giant male is mated to White Leghorn females, all the progeny will be slow feathering.

The inspection of the wing feathers should be done as soon as the newly-hatched chicks are dry and fluffed out. This method is used commercially with a high degree of accuracy.

Factors which will influence sexing by the feather-growth method are briefly:—

If breeding hens are not pure for late feathering, the sexing of chicks will be difficult. In recent years late-feathering breeds such as Australorps and Rhode Island Reds, have been bred for early feathering, and the use of these females for breeding to early-feathering males, such as the White Leghorn, will complicate sex identification in their chicks at day-old age. For cross-breeding purposes, a late-feathering heavy breed can be bred by eliminating early-feathering chicks between 10 and 20 days of age. At this age,

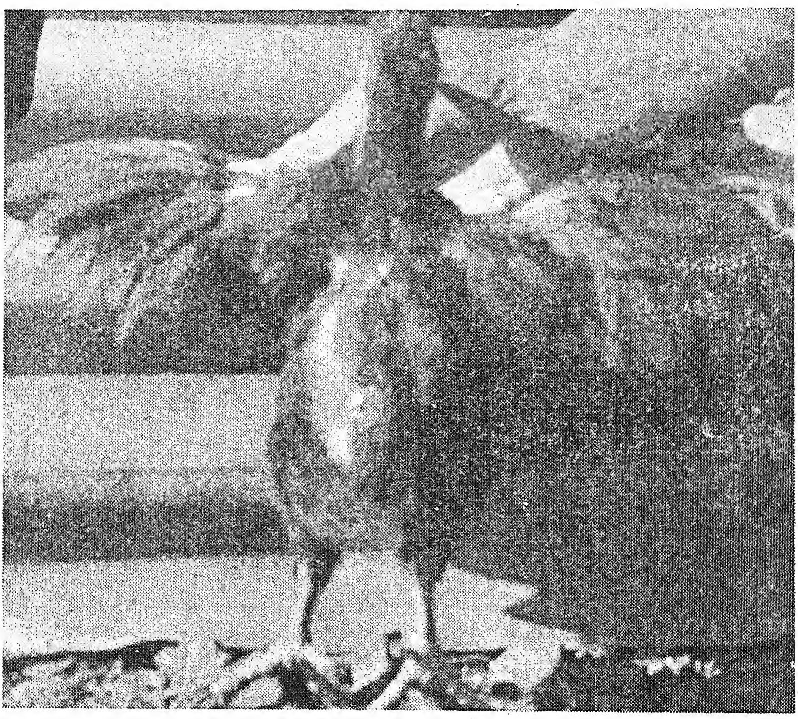

Fig. 2.—A slow feathering Australorp chick at 42 days of age. Note the naked back.

early-feathering chicks will show tail feathers. In Leghorns—an early-feathering breed—the wing and tail feathers are well developed at 9 to 12 days of age.

In the breeding of pure strains of poultry, late-feathering individuals are usually culled because the male chicks grow their feathers slowly and their backs are bare or naked even up to 6 or 8 weeks of age. For marketing as broilers these "naked-back" male chicks are unattractive and do not command the best price. This is the chief disadvantage of the feather-growth method of sex identification. (Figures 2 and 3.)

3. Wing-spot Method.

Jaap (1946) described the wing-spot method of sexing Rhode Island Red and New Hampshire chicks at day-old age. He obtained an accuracy in sexing of 90 to 95 per cent. in Rhode Island Reds and from 80 to 90 per cent. in New Hampshires.

The identification mark in day-old male chicks is a white or yellowish white spot on top of the wing in the region of the wing web. The wings of the female chicks are uniformly red in colour.

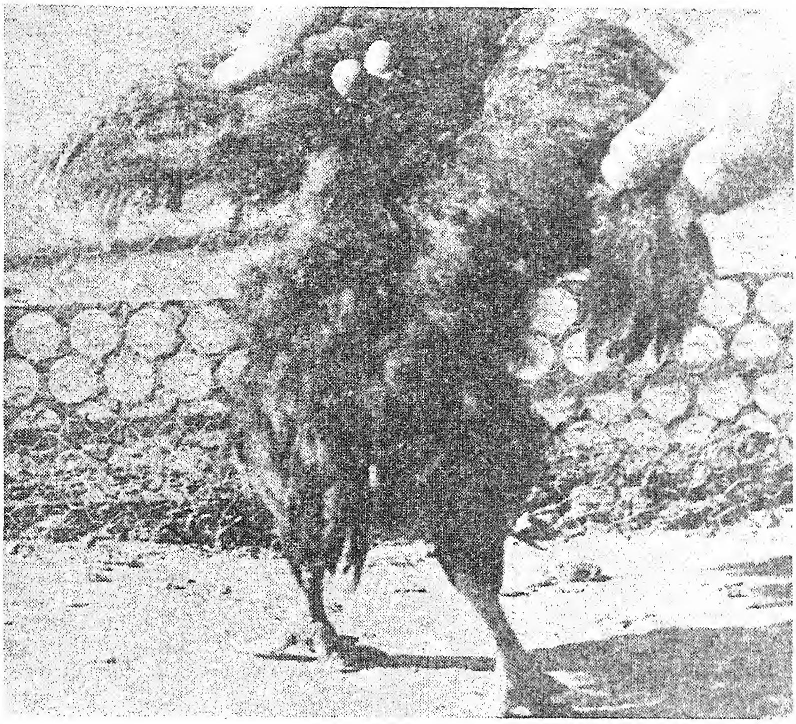

FIG. 3.—A rapid feathering chick at 42 days of age.

Errors in sexing are most likely to occur in uneven and light-coloured chicks when the wing spot is very small or indistinct. The chicks must be sexed as soon as they are dry and fluffed out.

4. Japanese or Vent Method.

In 1936 the late J. P. van der Merwe described the Japanese method in detail in Bulletin 175 published by the South African Department of Agriculture.

This method entails the examination of the vent or cloaca of day-old chicks in which slight anatomical differences are present in male and female chicks. The sexual organ is situated at the bottom and on the inside of the vent. The following anatomical differences can be recognized if the proper pressure is applied to the abdomen—

(*a*) about 30 per cent. of the chicks show no sexual organ and are all females;

(*b*) about 19 per cent. have very small, soft fleshy organs and are also females;

(*c*) about 50 per cent. of the chicks have stiff muscular organs and are all males.

For this method of sexing, skill in handling the chicks and speed in determining the size and prominence of the sex organs are important for reliable results. Experienced and skilled sexers can determine the sex with 95 to 98 per cent. accuracy.

5. Auto-sexing.

This term refers to sexing within the breed, or self-sexing. In 1930, Punnett and Pease introduced the Cambar, a breed which was originated by crossing Barred Plymouth Rocks and Campines. The male chicks of this new breed are of a pale grey shade, striped with brown, and the females are dark brown on hatching. The male Cambar chick has two doses of the barring factor and the female has only one, and as a result the male chicks at day-old age are paler in colour than the females. Some years ago Cambars were introduced into the Union, but only a few of the progeny are still alive.

Punnett and Pease also bred the Legbar which resulted from introducing the barring colour into Brown Leghorns. Working along the same lines at the Oklahoma Experiment Station, Jaap (1940) bred a large-bodied breed which he named the Oklabar. The first cross was made by mating White Plymouth Rocks and Rhode Island Reds. A male chick with striped down and white bars on the feathers was obtained and this male was mated to Rhode Island Red females. By various tested matings the progeny which carried the recessive white colour characteristic of the White Plymouth Rock were removed and these were not used for breeding purposes. Male chicks of a light-coloured blotchy type were finally mated with females which, as chicks, were striped and had cross bars of white on their feathers. It was found that chicks produced from this mating bred pure and that the sexes could be accurately distinguished at day-old age. The male chicks are always lighter in down colour than the females.

The breeding of Legbars with a characteristic Leghorn type requires several generations of selection. Jaap suggested the following matings to produce an auto-sexing Leghorn:—

Light Brown Leghorns are crossed with Barred Plymouth Rocks. In the first cross it does not make any difference which breed is used for the male parent. The first cross-bred males will be smoky-coloured barred birds. These males are mated to Brown Leghorn females. From this stage on only those chicks which have striped down are retained for further breeding. These must be marked at the time of hatching in order that they can be identified as adults. When these striped chicks feather, some will have white bars showing in part of their feathers. From these barred browns select those which most nearly resemble the Leghorn.

The third generation is produced by mating these selected males to Light Brown Leghorn females. Two or three additional back crosses of the same kind of barred brown male to Brown Leghorns may be required to eliminate all the Plymouth Rock characteristics. When the breeder is satisfied that all undesirable characters have been eliminated, the barred males and females are mated together. For the first time some male chicks appear with very light-coloured yellowish white replacing much of the dark-brown or black. These light-coloured chicks are the male Legbars. After they have been used with barred-brown females, the Legbar breeds true. Care must be taken to retain the white bars on the feathers.

At the Experimental Farm of the Agricultural Research Institute, Pretoria, experiments are in progress on the breeding of Brown Legbars from several breeds of poultry. Light Brown females have been bred from such crosses as: White Wyandotte × Rhode Island Red, Styria × Indian Game, Indian Game × Rhode Island Red and

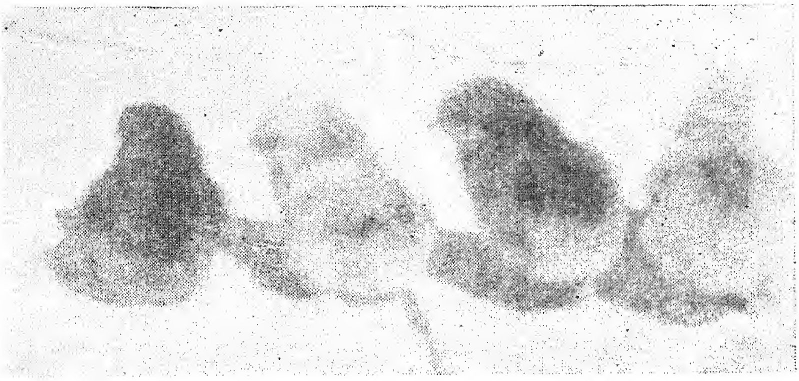

Fig. 4.—A self-sexing breed which is being bred at the Experimental Farm. The male chicks are lighter in down colour than the females.

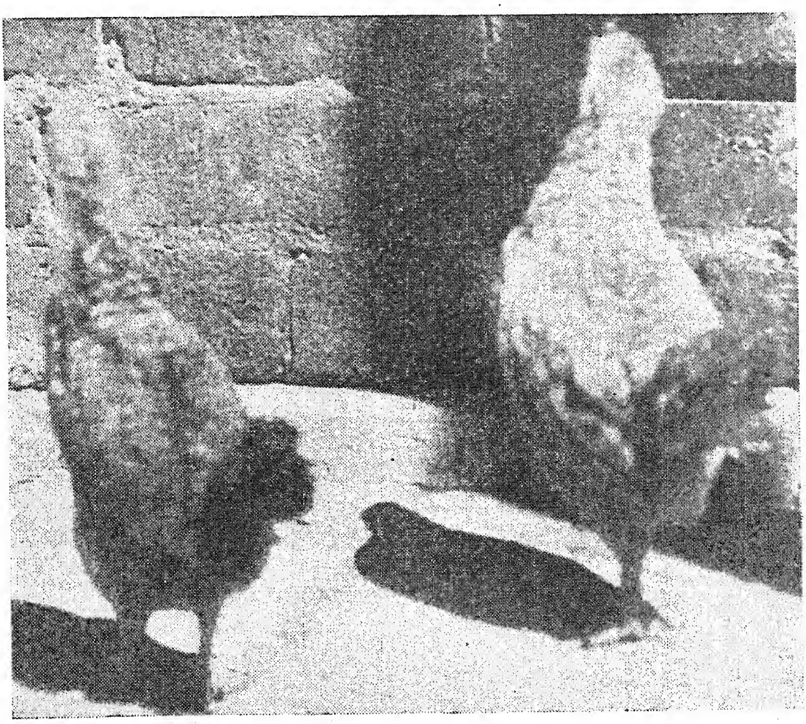

Fig. 5.—A male and female chick of the new breed. The male chick carries two doses of barring and the female only one.

dark Brown Leghorn × Rhode Island Red. Through several generations of selection, light brown females have been bred which are now being crossed with Barred Plymouth Rock males. The pure Brown

Legbar bred from these matings, produces a light-coloured male and a dark brown female chick (Figures 4 and 5). Further matings will be necessary to obtain 100 per cent. accuracy in sexing chicks at day-old age. In addition, the economic qualities of this breed will have to be improved.

Other methods of sexing besides those discussed in this article have been suggested, but as experimental proof in regard to their success is lacking, these have been omitted from consideration. No evidence is available that the fertility of eggs or the sex of chicks can be determined before the eggs are placed in the incubator.

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New Bulletins.

The undermentioned Bulletin has recently been published:—

No. 249. Winter Pruning and Trellising of Vines. Price 3d.

An Egg with a Bi-Coloured Shell.

Prof. A. M. Gericke, Department of Poultry Husbandry,
Agricultural Research Institute, Pretoria.

A Black Australorp hen, the pet of Master Nico Bonsma, son of Prof. F. N. Bonsma, surprised the owner in December, 1946 by laying a streamlined egg with one half of the shell a dark brown colour and the other half a light colour. The horizontal line of demarcation between the two colours is distinctly visible, as shown in the accompanying photograph.

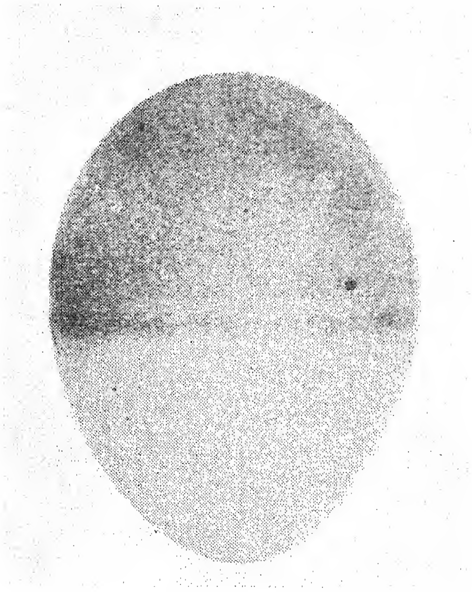

FIG.—Bi-coloured egg, the line of demarcation between the two colours being clearly visible.

The colour of a brown egg consists of a porphyrin pigment which is secreted directly on to the shell by cells lining the uterus. According to Warren and Conrad (1942) the pigment in a brown-shelled egg is deposited throughout the entire period of shell formation. From 50 to 74 per cent. of the shell pigment is added in the last five hours before the egg is laid. If an egg is removed from the oviduct of a hen normally laying brown eggs before the egg reaches the uterus, the shell will be white in colour.

Breeds such as the Australorp, Rhode Island Red, Plymouth Rock, Wyandotte and Sussex lay brown-shelled eggs, but the colour may vary considerably as a result of breeding and seasons of egg production. Hall (1944) found that Rhode Island Red pullets exhibited a distinct seasonal variation in egg-shell colour. The intensity of pigmentation decreased from the time laying started until early summer when there was a slight increase in colour which was retained until the end of the laying year. Dutch breeds of fowls such as the Barnevelder and Welsummer lay eggs with highly pigmented brown shells. Mediterranean breeds of fowls with prominent white earlobes lay white-shelled eggs. The Araucana, a breed with beard

growing from the throat and muffs on the upper part of the neck, is bred in Chile, South America, and lay eggs with a blue shell similar in colour to that of a duck.

No information is available as to the origin of eggs with bi-coloured shells, and therefore an explanation must rest solely upon speculation. It is interesting to note that the superficial brown pigment of the upper half of the shell could be removed by scratching with the finger nail, and on exposure the underlying colour represented the lighter colour of the lower half of the egg. Steggerda and Hollander (1944) reported a similar phenomena in egg shells which showed areas of depigmentation, but the areas were not symmetrical and as clearly demarcated as in the bi-coloured egg. They considered the occurrence of such eggs to be due to a spontaneous separation of the processes of lime and pigment secretion. One may assume that the bi-coloured egg originated as a result of incomplete secretion of colour matter in the uterus, or that the egg was delayed in the uterus during which period the additional colour was deposited on to the upper half of the shell.

Danger of Trees and Shrubs on Earthen Embankments :—

[*Continued from page* 376.

of the year, there is even greater danger when ants, moles, mice, meercats, etc., dig their tunnels right through the banks, since that creates the possibility of destruction by the first flood waters of the rainy season. In dams with only a slight permanent inflow, these channels may extend far below the high-water mark, in which case the wall is also liable to break with the first flood.

It is clear, therefore, that we should remain on our guard and that our task will be considerably facilitated if a watchful eye is kept on the wall and its surroundings. Shrubs should therefore be eradicated as soon as they appear and a time should be set aside annually for this purpose.

If general maintenance work such as the filling up of low places, the examination and improvement of paved portions, etc., is done at the same time, the structures will definitely have a longer useful life.

The old saying, viz. prevention is better than cure, remains a sound admonition.

Crops and Markets

A Statistical and Economic Review of South African Agriculture

by

The Division of Economics and Markets

Volume 26 APRIL 1947 No. 296

CONTENTS

Price Review for February 1947.*

Fruit.—The markets were fairly well supplied with pears, apples, grapes, pomegranates and quinces. Peach offerings, however, decreased sharply and experienced an exceptionally strong demand. Moderate quantities of pineapples, mangoes, guavas and avocadoes were disposed of satisfactorily.

Tomatoes.—Tomato offerings decreased, and prices, particularly in the case of tomatoes of good quality increased. On the Johannesburg market, for example prices of National Mark No. I tomatoes increased from 5s. to 5s. 6d. per tray; on the Cape Town market from 2s 11d. to 3s. 4d. per tray; and on the Durban market from 1s. 6d. to 3s. 1d. per tray.

Onions.—The supply of onions decreased slightly on most markets and prices increased somewhat. On the Johannesburg market prices of Cape onions, for example, increased from 14s. to 14s. 5d. per bag and on the Cape Town market from 11s, 5d. to 11s. 9d. per bag while local onions on the Durban market increased from 15s. 6d. to 16s. 1d. per bag.

Potatoes.—Still greater quantities of potatoes reached the markets and prices dropped further. Prices of Transvaal potatoes grade I, for example, fell from 12s. 4d. to 10s 1d. per bag on the Johannesburg market; Natal potatoes on the Durban market from 15s. 1d. to 12s. 7d. per bag; and Transvaal potatoes on the Pretoria market from 11s. 8d. to 9s. 9d. per bag.

Vegetables.—Except for Hubbard squashes and pumpkins which were well supplied, vegetable offering decreased sharply on the Johannesburg market, particularly in the case of beetroot, cabbage and green peas. On most of the other markets vegetable offerings were, however, too small to meet the particularly good demand and prices throughout remained high.

* All prices mentioned are averages.

Seeds, Grain and Fodder.—Supplies decreased sharply and prices were firm. Dry beans were more plentiful than dry peas. The other kinds were offered in moderate quantities.

Fodder.—In general the quality was poor, particularly in the case of teff and sweet grass. Good supplies of sweet grass were available and teff was plentiful, particularly during the second half of the month. Lucerne offerings, chiefly from the Cape Province, were in general of poor quality. Lucerne of good quality experienced a strong demand.

Eggs and Poultry.—Eggs were moderately well supplied on the Johannesburg market, but were still fairly scarce on the other markets and generally prices were high. Further increases in the maximum wholesale and retail prices of eggs were announced at the beginning of March. Good supplies of poultry were available on the Johannesburg market, and high prices were realized.

Index of Prices of Field Crops and Pastoral Products.

THE above index, which appears elsewhere in this issue increased from 202 the previous month to 203 in February 1947.

The most important changes occurred in the following groups:—

(*a*) "Hay" decreased from 144 to 127, particularly as a result of a decrease in lucerne prices.

(*b*) "Other Field-Crops", i.e. potatoes, onions, sweet-potatoes, and dry beans, decreased from 174 to 157 as a result of a further price decrease, particularly in the case of potatoes.

(*c*) "Pastoral Products" increased from 178 to 187 due to an increase in the average wool prices.

(*d*) "Slaughter Stock" decreased from 200 to 191 as a result of the reduction in the seasonal price of slaughtered cattle in controlled areas.

(*e*) "Poultry and Poultry Products" increased from 238 to 248 in February, particularly due to a further increase in the prices of eggs, fowls and turkeys.

Agricultural Conditions in the Union during February, 1947.

Weather Conditions.—Good showers of rain occurred in many parts of the summer-rainfall area. The rains were, however, widely scattered and were accompanied by hail which caused considerable damage in some places. Soaking showers were, however, necessary over the whole of the Union to see summer cereals and pastures through.

Crops.—Summer cereal crops were still promising. In some areas maize began to suffer from drought and urgently needed rain, particularly in the western Transvaal and the western Orange Free State. Timely showers later in the season will ensure that a good summer cereal crop is harvested.

Stock and Pastures.—As a result of the scattered showers of rain, the condition of stock and pastures varied. In the Karoo farmers suffered stock losses and rain was urgently required for the pastures and water supplies. Except for lumpy skin disease and nagana, which still occurred in Natal, stock diseases were quiet.

Review of the Wool Market during February 1947.

DURING February 1947 a total of 123,450 bales of wool was offered for sale in Union ports, of which 98,820 bales (80 per cent.) were sold.

Competition was keen for wool of good quality, particularly spinning and super wools which were offered in limited quantities. For most types of wool the average prices were higher than those of the previous month.

Fruit Estimates : February 1947.

THE drought still continued in the western Cape Province and was aggravated by abnormal heat conditions which prevailed in nearly all parts of the western Cape.

The Fruit Crop.

Peaches.— With the exception of the last portion of the clingstone crop, all varieties have already been harvested. Late varieties, particularly Kakamas, are yielding well, but as a result of the drought the fruit is on the small size.

Prunes.—The prune crop, which has almost been harvested, has undoubtedly been the best since 1942.

Pears.—Notwithstanding the drought conditions, it appears that this year's pear crop would be the best in the history of pear growing in the western Cape Province. The crops are not only heavy but are also exceptionally free from codlingmoth infestation. In some areas, particularly the Koo, the fruit is on the small side, but nevertheless still marketable.

Apples.—Good average crops are expected although they will not by any means be as good as those of last year. In the Elgin area, for example, the estimate of the crop is one third that of the previous year.

Grapes.—The drought conditions also began to affect the table grape crop, particularly in the Hex River Valley. In this area the leaves of some vineyards were beginning to wither and fall. It appears that the crop will undoubtedly be poorer than that of the previous year. The quality, moreover, will leave much to be desired.

Diseases and Pests.

Diseases.—The position is exceptionally favourable. Diseases such as Mildew Fusicladium and Anthracnose, which caused considerable damage in some previous seasons, are exceptionally quiet this year.

Pests.—The same applies to insect pests. Reports from the different apple and pear areas indicate that the codling-moth infestation as yet remains small. With the exception of the mealy bug in late grapes in the Hex River Valley, the insect position remains satisfactory.

Maximum Prices of Eggs.

THE maximum wholesale and retail prices of eggs in controlled areas as fixed on 7 February 1947 (See "Crops and Markets" of March 1947) have been increased all round by 3d. per dozen for each grade as from 7 March, 1947, while the maximum price at which eggs may be sold in uncontrolled areas has also been increased by a further 3d. per dozen.

(See Government Gazette Extraordinary of 7 March, 1947.)

Control of Potatoes.

THE present season's crop of summer potatoes is exceptionally large. During the past few months increasing quantities reached the markets and sharp price declines occurred.

In January 1947 the average price of Transvaal No. I potatoes on the Johannesburg market was for example, 12s. 4d. per bag (150 lb.) in comparison with 34s. 8d. per bag in January 1946. Similar sharp price decreases occurred on the other markets.

Producers' prices have fallen by more than half the fixed prices. Consumers' prices have fallen much less. The fixed maximum consumers' prices had in view the protection of the consumer, particularly when supplies were limited. Consumers' prices did not, however, decrease in sympathy and in order to assist the consumer and also to encourage larger consumption, the fixed top level prices, including consumers' prices, have been completely withdrawn with effect from 26 February 1947.

In order to exercise a greater measure of control over the potato industry, a Potato Control Board has also been established with power to take certain steps relating to the marketing of potatoes whereby surplus potatoes will be disposed of in the most profitable way. A more stable price will thus be assured to producers.

The Board consists of 12 members of which 7 are producer members (viz. 3 for Transvaal, 2 for the Orange Free State and one each for the Cape Province and Natal), 2 representatives of agents in the controlled areas, 2 representatives of consumers and one a member of the Department of Agriculture.

The Board has the power under the authority of the Minister of Agriculture to purchase such quantities of potatoes of any particular class or grade as it may deem necessary for the purpose of regulating the market, as well as the power to export potatoes.

In order to stabilize the overall price both for export and for potatoes bought by the Board and to meet Administrative expenses, the Board may impose a levy not exceeding a shilling per bag on potatoes sold in the controlled areas.

The levy is payable by a market-master in the case of potatoes sold by a market-master, and, when not sold by a market-master, by the person effecting the sale.

(For full particulars see Government Gazette Extraordinary No. 3770 of 26 February 1947).

Prices of Seed Potatoes.—The maximum prices of seed potatoes as fixed thus far have been discontinued as from 7 March 1947.

Prices of Fresh Milk to Producers.

AVAILABLE figures, given in the table below, indicate that by the end of 1946 prices paid to producers for fresh milk in the main urban centres of the Union were more than double those paid at the beginning of the War. A steady advance, in keeping with the general rise in prices, has taken place throughout the intervening period. During the first few years of hostilities the trade was characterized by a change-over from a period of seasonal surpluses to one of prolonged scarcity, and at the higher prices a ready market was found for fresh milk.

With the exception of the determinations under the short-lived Fresh Milk Scheme of 1940, price changes were at first effected without the intervention of price control. By 1944, however, frequent and confusing reports from all parts of the country of increases in

consumer prices resulted in action by the Price Controller through the publication of a notice (No. 1299 of August 8th, 1944) of Union-wide application, freezing all fresh-milk prices at the levels ruling during the week ending 7 July of that year. Subsequent increases were granted only on the authority of the Price Control Office. Where the provisions of the notice were repealed and new advances in prices permitted, the Price Controller, until the latter part of 1946, fixed prices in the distributive trade only. Producers prices were subject to voluntary agreements, sanctioned by the Department of Agriculture, between the fresh-milk interests concerned.

Government Notices fixing fresh-milk prices to producers first appeared in November last year, the areas affected being the Cape Peninsula, the Witwatersrand and Pretoria. In the face of abnormal shortages, irregularities which occurred in the buying and selling of milk made these enactments absolutely necessary. Milk sold by producers to distributors in the Port Elizabeth area has since come under similar ruling.

The higher prices now being paid to producers are partly attributable to a phenomenal increase in consumption and partly to the continuous rise in production costs during the period 1939 to 1946. Over the last two years, however, fresh-milk farmers have been confronted with problems which have rendered their task increasingly difficult. Serious droughts, an acute shortage of protein-rich concentrates, which has meant a lowering in quality of dairy rations, and the incidence of lumpy skin disease, especially in Transvaal herds, have all been a threat to the supply position and are the main reasons for the price increases granted in 1946.

Quota Prices of Fresh Milk to Producers.

Year.	Johannesburg.	Cape Town.*	Durban.	Pretoria.	Port Elizabeth.	Bloemfontein.	East London.	Pietermaritzburg.
	d.	d.	d.	d.	d.	d.	d.	d.
1937	11·0	10·5	8·0	—	9·8	10·0	9·6	7·2
1938	11·5	11·1	8·0	—	—	9·3	9·6	8·2
1939	11·7	10·9	8·0	—	—	—	9·3	7·5
1940	12·6	11·3	8·0	—	—	—	9·9	8·5
1941	13·8	—	8·9	13·9	—	—	11·1	—
1942	17·5	14·7	14·6	16·3	14·2	13·3	13·8	14·3
1943	19·5	19·9	19·2	19·0	17·3	15·3	16·4	18·5
1944	20·0	20·4	19·0	20·0	18·0	16·0	17·2	19·0
1945	20·7	21·0	19·0	20·7	18·0	17·7	19·1	19·0
1946—								
January	21·0	21·0	19·0	21·0	18·0	18·0	20·0	19·0
February	21·0	21·0	19·0	21·0	20·0	18·0	20·0	19·0
March	21·0	24·0	19·0	21·0	20·0	18·0	20·0	19·0
April	21·0	24·0	19·0	21·0	20·0	18·0	20·0	19·0
May	23·0	24·0	19·0	23·0	20·0	18·0	21·9	19·0
June	23·0	24·0	19·0	23·0	20·0	18·7	24·0	19·0
July	23·0	24·0	19·0	23·0	20·4	20·0	24·0	19·0
August	23·0	24·0	19·0	23·0	22·0	20·0	24·0	19·0
September	23·0	24·0	19·0	23·0	22·0	20·0	24·0	19·0
October	23·0	24·0	20·0	23·0	22·0	20·0	24·0	20·0
November	23·3	24·0	21·0	23·3	22·0	20·0	24·0	21·0
December	24·0	24·0	21·0	24·0	22·0	20·0	24·0	21·0

* Until 1944 weighted average of all prices paid to producers. Subsequent prices given are quota prices.

Index of Prices of Field Crops and Animal Products.

(Basic period 1936-37 to 1938-39 = 100.)

SEASON (1 July to 30 June).	Summer cereals. (a)	Winter cereals. (b)	Hay. (c)	Other field crops. (d)	Pastoral products. (e)	Dairy products. (f)	Slaughter stock. (g)	Poultry and poultry products. (h)	Combined index.
WEIGHTS.	19	13	2	3	34	6	17	6	100
1938-39.......	92	109	96	89	79	102	106	94	93
1939-40.......	86	114	77	95	115	105	106	89	104
1940-41.......	108	120	106	156	102	108	110	103	109
1941-42.......	120	144	143	203	102	131	135	136	124
1942-43.......	160	157	144	159	122	147	168	167	147
1943-44.......	170	186	137	212	122	154	185	188	159
1944-45.......	183	186	160	281	122	177	179	184	164
1945-46.......	201	194	164	312	118	198	185	170	170
1946—									
January.......	198	194	191	347	118	204	188	204	174
February......	198	194	158	305	118	186	184	224	171
March.........	198	194	160	280	118	186	181	241	171
April..........	198	194	176	298	118	186	180	279	174
May...........	249	194	170	284	119	186	177	289	184
June..........	246	194	178	287	119	218	178	260	184
July...........	245	194	182	303	120	231	183	193	182
August........	242	194	181	319	120	231	188	164	181
September.....	243	194	183	351	163	231	196	156	198
October........	240	194	166	365	171	231	204	155	201
November.....	240	210	165	309	179	194	208	171	204
December......	242	210	157	236	168	194	208	201	200
1947—									
January.......	242	210	144	174	178	194	200	238	202
February......	240	210	127	157	187	194	191	248	203

(a) Maize and kaffircorn.
(b) Wheat, oats and rye.
(c) Lucerne and teff hay.
(d) Potatoes, sweet potatoes, onions and dried beans.
(e) Wool, mohair, hides and skins.
(f) Butterfat, cheese milk and condensing milk.
(g) Cattle, sheep and pigs.
(h) Fowls, turkeys and eggs.

Average Prices of Onions and Sweet Potatoes on Municipal Markets.

SEASON (1 July to 30 June).	ONIONS (120 lb.). Johannesburg. Transvaal.	Johannesburg. Cape.	Cape Town. Cape.	Pretoria. Cape.	Durban. Local.	Durban. Cape.	Sweet Potatoes. (120 lb.). Johannesburg. Table.	Durban.	Cape Town.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39.......	8 3	8 10	7 4	7 10	8 6	9 6	5 7	4 8	5 3
1939-40.......	6 3	9 10	7 3	9 11	9 8	10 5	5 7	5 9	5 0
1940-41.......	12 5	12 3	9 10	11 11	11 2	12 7	7 3	6 4	5 5
1941-42.......	10 5	13 11	10 4	13 10	13 0	14 3	9 10	7 1	8 4
1942-43.......	13 8	14 0	12 6	14 7	12 9	14 5	9 8	8 1	8 5
1943-44.......	16 2	18 9	15 1	17 4	19 1	19 2	12 0	10 9	10 7
1944-45.......	14 7	18 7	14 8	18 1	18 8	19 5	17 3	15 1	16 3
1945—									
January.......	12 9	13 1	9 11	14 8	12 3	13 5	18 2	7 8	14 7
February......	13 5	13 10	9 9	10 4	12 2	14 0	16 0	8 1	10 8
March.........	13 10	15 2	11 4	14 9	18 9	17 0	12 6	9 6	12 5
April..........	17 8	17 5	14 6	16 9	12 6	17 8	9 11	7 5	9 1
May...........	16 4	17 11	12 0	18 0	19 11	20 10	10 4	7 1	11 4
June..........	20 3	17 11	14 4	18 4	15 4	18 1	9 4	8 2	9 4
July...........	16 7	18 7	15 5	16 8	17 7	20 5	10 4	8 8	12 4
August........	18 7	18 4	15 7	18 3	16 9	19 4	11 3	8 9	12 1
September.....	16 1	17 7	16 1	19 11	19 3	20 5	15 0	12 11	14 2
October........	10 8	14 5	12 11	14 8	10 4	15 10	19 0	15 6	17 0
November.....	12 3	9 3	13 0	—	14 3	13 10	19 11	19 1	21 3
December......	14 8	15 3	15 6	17 10	16 11	15 7	17 1	14 6	17 7
1946—									
January.......	12 0	12 1	9 7	—	11 7	13 0	17 1	15 6	17 3
February......	12 3	13 8	11 1	13 1	15 2	9 11	17 3	10 3	17 2
March.........	11 4	12 4	9 9	12 10	12 9	13 5	18	14 8	14 8
April..........	12 1	12 10	11 3	13 10	15 1	14 9	15 2	17 4	14 7
May...........	13 6	13 9	11 9	13 9	12 10	14 7	15 8	15 6	14 5
June..........	14 7	15 5	12 2	17 1	15 11	14 11	14 11	14 8	15 1
July...........	11 10	14 3	12 0	15 0	15 2	15 6	15 2	15 2	17 4
August........	14 9	17 0	13 7	15 10	20 6	18 7	16 10	16 0	18 3
September.....	20 9	25 3	20 4	23 2	21 5	23 3	20 0	16 5	22 11
October........	24 9	28 1	32 5	24 0	32 3	31 8	24 6	16 9	20 10
November.....	21 11	—	26 11	—	24 8	21 1	23 10	15 1	20 8
December......	16 8	15 2	12 4	—	19 8	19 6	18 11	11 11	25 5
1947—									
January.......	14 9	14 0	11 5	14 10	15 6	14 3	16 6	9 6	19 8
February......	14 8	14 5	11 9	13 7	16 1	17 8	16 11	7 6	18 11

Average Prices of Lucerne, Teff, Kaffircorn and Dry Beans.

Season and Month (b).	Lucerne (per 100 lb.). Johannesburg (a). Cape.	Lucerne Johannesburg (a). Transvaal.	Lucerne Cape Town 1st grade.	Teff Johannesburg (a) 100 lb.	Kaffircorn in bags (200 lb.). F.o.r. producers' stations. K1.	Kaffircorn F.o.r. producers' stations. K2.	Dry Beans (200 lb.) bags. Johannesburg (a). Speckled Sugar.	Dry Beans Johannesburg (a). Cow-peas.	Dry Beans Johannesburg (a). Kidney.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	3 10	3 1	4 0	2 7	13 1	12 9	25 0	16 9	24 2
1939-40	3 0	2 5	3 4	2 6	8 8	9 4	21 11	13 11	21 2
1940-41	4 2	3 5	4 3	3 3	15 6	17 0	30 0	16 8	27 11
1941-42	5 7	5 2	5 8	4 7	18 10	19 6	32 10	19 8	28 3
1942-43	5 5	6 0	7 4	5 5	24 10	24 10	34 0	25 8	24 2
1943-44	5 4	5 6	7 3	4 5	21 0	21 7	49 6	29 11	32 1
1944-45	6 4	5 4	7 2	4 9	18 8	18 8	88 7	39 6	70 6
1946—									
January	7 6	—	8 1	5 9	20 6	20 6	103 4	68 6	75 4
February	6 0	5 10	8 1	5 9	20 6	20 6	90 8	69 3	69 4
March	6 2	5 3	7 4	5 4	20 6	20 6	86 8	61 11	63 7
April	7 0	5 6	7 4	4 11	20 6	20 6	91 4	51 0	74 3
May	6 10	5 1	7 6	4 6	69 11	69 11	90 6	52 11	75 7
June	7 3	5 6	7 6	4 5	60 8	60 8	84 2	45 9	66 1
July	7 5	6 9	7 3	4 5	57 10	57 10	81 8	45 1	67 7
August	7 5	4 8	7 3	4 3	48 5	48 5	69 11	41 1	61 7
September	7 6	7 0	7 3	4 4	50 0	50 0	73 0	40 4	61 11
October	6 9	4 11	6 9	4 1	40 3	40 3	69 2	34 5	56 6
November	6 9	5 10	7 2	3 11	40 10	40 10	61 4	35 3	59 10
December	6 3	5 6	7 3	4 5	48 8	48 8	71 1	36 6	52 11
1947—									
January	5 10	5 11	7 5	3 8	48 9	48 9	61 4	33 11	51 4
February	5 0	4 10	7 5	3 11	40 11	40 11	44 3	33 6	44 3

(a) Municipal Market.
(b) Seasonal year for kaffircorn, 1 June–31 May. Dry Beans, 1 April–31 March; Lucerne and teff, 1 July–30 June.

Average Prices of Green Beans, Green Peas and Carrots on Municipal Markets.

Season (1 July to 30 June.)	Green Beans (Pocket 20 lb.). Johannesburg.	Green Beans Cape Town.	Green Beans Durban.	Green Peas (Pocket 20 lb.). Johannesburg.	Green Peas Cape Town.	Green Peas Durban.	Carrots (Bag). (a). Johannesburg.	Carrots Cape Town.	Carrots Durban
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	1 8	2 3	2 0	2 4	1 9	1 2	3 8	2 6	6 1
1940-41	1 11	2 9	1 5	2 8	2 4	2 3	5 9	4 11	13 4
1941-42	2 7	3 10	2 6	3 11	3 3	3 4	8 5	8 11	17 2
1942-43	3 1	4 3	3 0	3 3	2 10	3 9	5 1	8 9	13 2
1943-44	3 8	4 11	3 0	4 11	4 10	4 11	9 11	11 1	20 2
1944-45	3 7	5 1	4 1	4 9	4 1	5 5	8 3	9 11	19 10
1945-46	3 4	4 7	3 6	5 11	7 2	6 1	8 10	11 4	17 1
1945—									
January	1 10	0 11	2 4	4 3	1 9	6 7	7 7	3 1	10 2
February	1 7	3 4	2 3	5 5	6 9	7 4	7 8	6 11	19 1
March	2 3	4 11	2 6	7 7	12 0	6 7	9 5	6 3	25 4
April	1 11	2 8	1 10	4 4	6 6	4 0	8 6	13 9	19 6
May	3 3	5 3	2 3	5 9	9 11	3 1	9 5	8 7	21 6
June	4 3	4 2	5 0	4 9	7 9	3 8	10 0	10 10	13 9
July	9 10	7 10	5 10	8 2	11 7	8 8	10 1	16 4	20 11
August	7 4	6 4	6 10	5 8	7 10	5 5	13 4	17 11	12 11
September	3 1	5 9	4 1	2 8	4 1	2 4	7 5	12 8	16 8
October	3 8	5 4	4 9	4 4	3 6	7 7	9 6	9 10	20 11
November	1 6	3 4	2 4	9 0	4 0	9 4	9 8	8 8	16 4
December	2 4	2 3	2 8	12 1	—	12 5	10 9	7 10	13 10
1946—									
January	3 4	1 11	5 6	8 8	10 11	14 7	9 8	6 2	16 0
February	1 11	—	2 3	6 5	—	6 4	7 3	7 11	14 1
March	2 10	1 1	2 5	6 1	—	3 4	8 10	8 1	23 10
April	2 7	3 4	3 1	5 7	—	4 10	10 2	9 3	24 2
May	1 9	3 0	2 2	7 2	3 10	5 10	7 1	6 3	18 8
June	1 10	2 0	2 8	4 8	4 1	5 7	4 2	7 6	11 7
July	3 2	1 11	2 2	2 7	3 6	3 4	3 8	4 8	7 10
August	6 3	4 2	6 6	5 10	5 0	4 9	4 5	3 8	11 0
September	6 6	7 5	6 4	5 0	4 11	5 1	3 8	3 2	10 11
October	5 0	5 0	5 2	3 3	3 6	5 7	4 7	4 1	9 7
November	2 11	2 7	1 11	6 5	3 10	9 5	6 3	3 7	11 5
December	3 9	2 8	2 5	9 0	—	7 0	7 6	5 4	19 5
1947—									
January	3 0	—	3 5	4 0	8 7	4 9	7 7	—	16 5
February	4 2	—	5 1	3 2	12 2	5 8	10 4	—	12 8

(a) Weights of bags vary, but on the average are approximately as follows:—Johannesburg, 130 lb.; Cape Town, 90 lb.; and Durban, 120 lb.

Prices of Avocados and Papaws on Municipal Markets.

SEASON	AVOCADOS (Per Tray). (a)				PAPAWS. (b)					
	Cape Town.	Durban.	Johannesburg.		Cape Town Std. Box.	Durban. Tray.	Johannesburg.		Port Elizabeth Std. Box.	Bloemfontein Std. Box.
			Ordinary.	N.M.			Ordinary Std. Box.	N.M. Std. Box.		
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	1 6	0 11	1 3	1 11	2 0	0 10	1 7	2 0	2 0	1 8
1939-40	2 1	1 2	1 9	2 11	2 3	0 10	1 4	1 9	1 11	1 6
1940-41	1 10	0 10	1 5	2 4	2 1	1 1	1 9	2 2	2 3	1 9
1941-42	2 4	1 7	2 1	3 4	2 5	0 10	1 10	2 1	1 11	2 0
1942-43	3 1	1 8	2 10	4 3	3 2	1 2	2 1	2 7	2 2	2 0
1943-44	4 1	1 6	3 7	5 3	3 2	1 5	2 5	3 5	3 3	2 7
1944-45	—	—	—	—	3 4	1 6	3 1	4 1	3 5	3 0
1946—										
January	8 1	1 8	5 10	9 2	3 10	1 6	4 5	7 11	6 4	3 11
February	3 4	0 10	3 1	5 0	2 10	1 5	7 1	5 6	5 6	4 7
March	2 11	3 7	2 8	4 0	—	1 1	6 6	7 8	6 4	5 8
April	2 8	1 11	3 4	4 9	5 5	1 1	5 6	7 11	6 3	4 6
May	3 0	1 10	3 7	5 5	5 1	1 1	4 9	5 8	4 7	4 2
June	3 6	2 3	4 5	6 4	3 8	2 5	4 10	5 9	5 2	4 0
July	4 1	1 9	5 6	6 3	4 11	2 7	5 4	6 0	6 3	4 11
August	5 7	5 1	5 10	6 8	5 1	2 6	4 4	5 1	4 9	4 4
September	9 3	—	6 5	5 8	2 10	1 6	2 8	3 2	2 3	2 11
October	8 8	4 7	5 11	6 7	2 5	1 4	1 9	2 4	2 2	1 10
November	8 6	3 6	6 3	7 4	2 8	0 8	2 3	2 11	2 11	2 8
December	8 9	2 0	5 11	8 3	3 7	1 9	3 7	4 8	4 11	2 6
1947—										
January	7 11	—	5 5	—	4 6	1 8	[illegible] 10	6 6	8 0	3 9
February	2 6	—	2 11	—	4 9	1 5	[illegible] 10	—	8 11	—

(a) Season 1 January to 31 December.
(b) Season 1 April to 31 March.

Prices of Bananas and Pineapples on Municipal Markets.

SEASON.	BANANAS (Per Crate) (a)			PINEAPPLES. (b)						
	Cape Town.	Johannesburg.	Pretoria.	Cape Town. Box.	Durban. Doz.	Johannesburg.		Port Elizabeth. Box.	East London. Doz. Large.	Bloemfontein. Bushel Box.
						Ordinary. Doz.	Queens and Giants. Doz.			
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	22 5	9 10	16 5	5 4	3 3	1 1	—	3 5	1 2	4 10
193[illegible]	24 4	8 7	15 10	6 1	3 10	1 4	4 8	3 10	1 5	4 9
194[illegible]	27 0	7 2	14 3	5 10	2 8	1 5	2 1	4 5	1 5	5 10
1941 [illegible]	28 6	7 6	14 6	6 6	3 0	1 7	2 5	4 6	1 8	6 2
1942-43	30 0	11 9	22 7	7 4	3 0	1 8	3 10	4 11	2 1	7 3
1943-44	27 8	13 2	18 10	8 3	3 6	2 4	2 1	6 3	2 10	8 4
1944-45	—	—	—	10 4	3 9	2 6	3 9	7 3	3 3	8 6
1945—										
January	31 9	12 11	14 0	7 7	—	1 4	2 2	6 3	2 4	6 3
February	32 8	13 5	16 7	5 11	—	1 5	1 3	5 4	2 7	6 11
March	27 1	13 7	14 8	6 3	—	1 7	2 5	4 11	4 7	5 6
April	34 11	14 10	17 4	7 4	—	2 2	3 5	5 9	2 11	6 4
May	30 11	10 3	13 7	8 4	2 9	3 5	2 10	9 4	2 7	8 2
June	31 5	9 4	12 6	8 10	2 7	5 4	5 9	10 9	4 4	8 6
July	33 11	10 6	19 4	13 2	2 5	7 1	5 6	17 7	3 5	15 3
August	38 1	16 1	16 4	12 9	4 1	5 4	5 9	13 8	3 3	13 11
September	53 7	20 3	13 1	11 7	8 3	5 9	6 2	10 4	5 0	15 8
October	70 8	41 1	33 4	13 1	10 7	7 6	5 8	16 0	4 6	14 1
November	68 0	32 4	25 1	10 10	10 9	4 5	5 0	12 4	4 10	13 6
December	75 11	17 7	11 1	10 7	7 4	3 4	4 6	7 7	5 9	8 5
1946—										
January	31 9	14 4	14 11	10 4	3 0	3 5	3 4	8 7	2 9	9 3
February	54 3	12 0	13 8	8 4	2 9	2 8	4 0	8 5	4 6	9 7
March	69 7	17 3	28 6	9 10	5 9	3 0	3 8	7 1	6 7	11 6
April	75 5	29 5	17 7	11 8	5 7	4 0	5 4	9 5	2 7	9 4
May	76 8	29 8	22 2	7 6	4 6	3 4	3 6	8 3	3 10	8 7
June	77 11	23 5	26 7	10 7	5 0	4 7	4 7	7 5	6 3	12 3
July	60 11	25 4	25 8	15 7	3 2	9 3	10 3	15 5	5 7	13 5
August	72 1	23 9	31 5	19 10	4 10	7 11	9 7	16 10	4 7	13 10
September	66 5	20 6	30 8	10 1	7 7	6 5	7 2	12 2	4 7	13 11
October	78 10	28 6	34 6	15 5	6 5	6 9	6 5	13 10	4 3	14 5
November	63 8	47 10	32 4	14 10	8 11	6 3	5 4	13 10	4 6	15 11
December	67 7	30 7	35 4	16 5	4 5	7 0	—	11 11	4 7	17 8
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January	41 7	20 2	20 4	9 2	5 1	2 3	3 6	6 8	3 6	7 5
February	46 0	14 10	15 10	6 10	2 0	2 0	2 7	5 4	3 7	6 8

(a) Season 1 January to 31 December.
(b) Season 1 October to 30 September.

PRINTED IN THE UNION OF SOUTH AFRICA BY THE GOVERNMENT PRINTER, PRETORIA

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(Photo on Cover: Nelspruit Experiment Station).

G.P.-S.14—1947-8—7,750.

Information on Departmental Publications.

Farming in South Africa, the monthly journal of the Department, contains popular as as well as scientific articles on a variety of agricultural topics, useful to both the farmer and the housewife, while the Crops and Markets Section supplies information on crop prospects, market prices and exports of agricultural produce.

The following particulars in regard to subscriptions and advertisements should be noted:—

Subscription.—Within the Union, South West Africa, Bechuanaland Protectorate, Southern Rhodesia, Swaziland, Basutoland, Mocambique, Angola, Belgian Congo, and British Territories in Africa, 5s. (otherwise 7s. 6d.) per annum, post free, payable in advance.

Applications, with subscriptions, to be sent to the Government Printer, Bosman Street, Pretoria.

Advertisements.—The Tariff for Classified Advertisements is: 2d. (two pence) a word with a minimum of 5s. per advertisement (prepaid). Repeats, not entailing any change in the wording, will be published at half the cost of the original.

Conditions:

(1) The advertisement will be classified under specific headings, and only one black letter (initial letter) is permitted.

(2) Advertisements in which prices are mentioned must contain the name and address of the advertiser. A nom-de-plume or box number only is not sufficient, and unless this condition is strictly observed, advertisements will not be accepted.

(3) Advertisements will be classified strictly in accordance with the subject-matter of the announcement, determined by the first item mentioned and cannot be inserted under irrelevant headings.

(4) Displayed, classified advertisements will also be accepted. The charge, however, will be 10s. per inch, single column, per insertion, without reduction for repeats.

Copy for Advertisements to be in the hands of the Government Printer, Pretoria, not later than the 20th of the month preceding publication.

Send all advertisements direct to the Government Printer, or write to him for details as to tariff for advertisements.

Popular Bulletins.—Bulletins on various agricultural topics are published by the Department to meet public demand. A list of available bulletins giving particulars of cost, etc., is obtainable free of charge from the Editor, Department of Agriculture, Pretoria.

Scientific Publications.—From time to time the different Divisions of the Department issue science bulletins incorporating the results of research work conducted by them Other scientific publications issued are: "The Onderstepoort Journal", "Memoirs of the Botanical Survey of South Africa", "Bothalia", "Entomological Memoirs" and the "Annual Reports of the Low Temperature Research Institute". Information in regard to these publications is obtainable from the Editor, Department of Agriculture, Pretoria.

Press Service.—The Press of South Africa is now supplied with a bulletin of agricultural information for their exclusive use. This information is supplied to all newspapers and other journals throughout the country.

Farmer's Radio Service.—In addition to the printed information supplied by the Department to members of the farming community, the Department, in collaboration with the South African Broadcasting Corporation, also has a national broadcasting service for farmers. Information in regard to times of broadcasting is contained in the programmes issued by the Broadcasting Corporation.

Inquiries.—All general inquiries in regard to the above should be addressed to the Editor, Department of Agriculture, Pretoria.

D. J. SEYMORE, Editor.

FARMING IN SOUTH ... AFRICA

VOL. 22 MAY 1947 No. 254

Editorial:

Thorough Soil Cultivation and Increased Food Production.

"PRODUCE more food" is the cry of a hungry world to-day. We in South Africa must also give ear to this cry, although we are not in immediate proximity to the scene of the worst suffering. Our own demands to-day exceed the supply from our own soil and very little can be expected from overseas. Everyone who is responsible for the production of food must, therefore, endeavour to employ every means of production as effectively as possible. Problems concerning the soil and plant-life have always been and are to-day more than ever the problems of a nation. In the successful solution of this problem lies the promise of food and other essentials for the existence of man.

In the sphere of crop production there is probably no single factor to rival thorough soil cultivation in influencing crop yields. Nevertheless, the yield alone should not be regarded as the criterion in thorough soil cultivation, since the soil-plant relation is ultimately of greater importance. Until recently, considerable attention was devoted to studies of the soil on the one hand, and to plant studies on the other. To a very large extent these two lines of study developed separately.

Our interest lies not only in the yields to be obtained through the application of a certain treatment, but also in the ultimate influence of such treatment on the soil, since there is an interaction between soil and plant which sometimes has far-reaching effects. When the matter is viewed in this light, the question arises as to whether we have actually made very great progress with research into soil cultivation, apart from its influence on increased production as a result of the eradication of weeds and the conservation of moisture.

The latter aspect is of decided importance to the South African farmer, since soil moisture is the limiting factor in crop production in most areas of this country. The precarious nature of our rainfall and the rapid evaporation which takes place under our climatic conditions justify the contention that there is possibly no single factor which can have such a detrimental effect on production as

slip-shod cultivation of the soil. This fact will be more readily appreciated if it is remembered that our principal crops are mesophytes, i.e. plants which require a moderate supply of water, and consequently need all the available soil moisture under our conditions. We must, therefore, conserve in the soil as much water as is possible without detrimental effects, and it is here that efficient cultivation of the soil plays so important a part. The tremendous effect of weed-infestation on production has been proved experimentally in semi-arid parts of the Union. Over a period of three years the uncontrolled growth of weeds reduced the production of maize by 11 bags per morgen, although there were considerably fewer weeds growing on these experimental plots than are usually found in practice in the maize lands of most farms. According to American figures, 271 tons of water are required to produce 1 ton of dry material in maize. The importance of conserving soil moisture by applying proper farming practices is, therefore, obvious.

Thorough cultivation of the soil, together with such supplementary practices as fertilization, the use of suitable varieties and the control of diseases and insect pests, will considerably increase the production of vital crops in this country, especially where, with a view to ensuring greater stability, the soil-plant relation is taken into consideration in the application of these cultivation practices.

(J. C. Erasmus, Lecturer in Field Husbandry, College of Agriculture, Glen.)

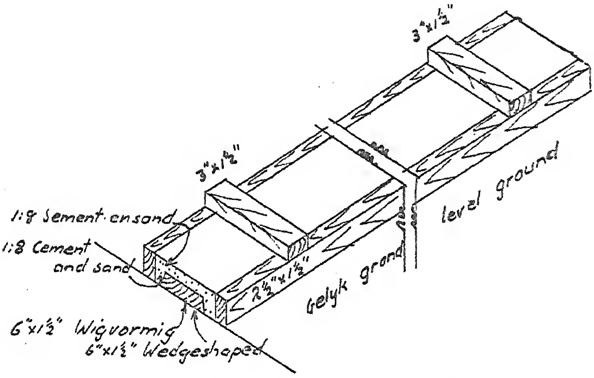
Levelling Outfits for Farmers.

IN order that farmers may help themselves in the surveying of anti-erosion works, the Director of Soil Conservation and Extension has made arrangements for the local manufacture and sale of reliable, but cheap instruments. The outfit consists of a telescopic dumpy level with tripod, levelling staff and instructions. It will be obtainable from the Division of Soil Conservation and Extension, P.O. Box 965, Pretoria, against a remittance of £10, accompanied by a certificate from the local Magistrate or Extension Officer, indicating that the applicant is a *bona fide* farmer.

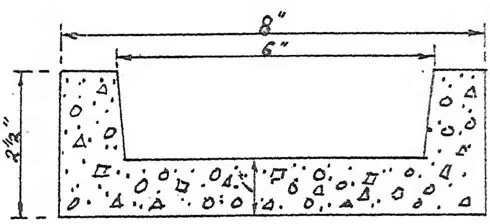
Storage Tank for Maize.

J. A. Vorster, Agricultural Research Institute, University of Pretoria.

SINCE India at present refuses to supply the Union with jute, farmers are experiencing difficulty with the storage of their maize. As a rule the bags are filled as the maize comes out of the threshing machine and are then taken to the grain elevator or to the farmer's shed or store room. With the shortage of jute bags some of the farmer's problems may perhaps be solved by the use of grain tanks.



VORMS OM SEMENT-BLOKKE TE GIET
FORMS FOR THE CASTING OF CEMENT BLOCKS



DEURSNIT DEUR SEMENT-BLOK
SECTION THROUGH CEMENT BLOCK

The question of storage tanks for maize has not yet been solved satisfactorily, however, since there are still many difficulties to be investigated.

The type of tank suitable for the purpose may be constructed of wood, galvanized iron, brick or concrete. Wooden tanks are out of the question in South Africa since timber is scarce and expensive and a good carpenter is required to build this type of tank. Nor are these tanks permanent.

Concrete tanks are uneconomical unless a whole series of the same shape can be built.

Galvanized iron tanks are effective and can be bought ready-made at a cost of about £23 per tank with a capacity for 110 bags. Tanks for 200 bags of maize will cost about £46. If the iron tanks are painted regularly, they last indefinitely. One difficulty attached to the storage of maize in iron tanks is that iron is an excellent conductor of heat.

During the day when the sun shines on the tank the maize against the tank walls is heated and moisture is exuded. At night when the tank cools rapidly, this moisture is condensed against the tank walls, causing the maize to become wet, and eventually the maize against the walls and under the lid becomes mouldy.

This difficulty may be overcome, however, by placing the storage tanks under a shed where they are not exposed to the direct rays of the sun. Mildew will be prevented in this way. The cost of the shed must, however, be added to that of the tank.

On the accompanying diagram full particulars are given for the construction of a brick tank with a concrete roof, with a capacity of 200 bags of maize. The plans were drawn up at the request of a farmer and the writer thought that other farmers might also be interested in this type of tank.

At the prevailing prices it will cost about £60 to build the proposed tank, i.e. if the farmer has to buy all the materials including timber for forms for the roof, sand, stone, etc.

Foundation.

The tank must have a good foundation, since a large portion of the weight of the maize rests directly on the foundation. A foundation of 2 feet by 9 inches on good firm soil and cast from a mixture of 6 parts of broken stone, 3 parts of sharp sand and 1 part of cement will be strong enough.

The floor in the tank should be at least 9 inches above the ground and the tank must not be situated in a hollow where water can dam. In the diagram the top of the floor is about 3 feet above the soil surface, making it possible for a bag to be filled under the outlet pipe. Otherwise the floor may be built lower and a hole made to hold the bag. This method is not recommended, however, since the bag will then have to be lifted from the hole.

The foundation walls up to the floor level should be 9 inches wide and built of bricks. If hard bricks are used, this part need not be plastered.

Floor and Outlet Pipe.

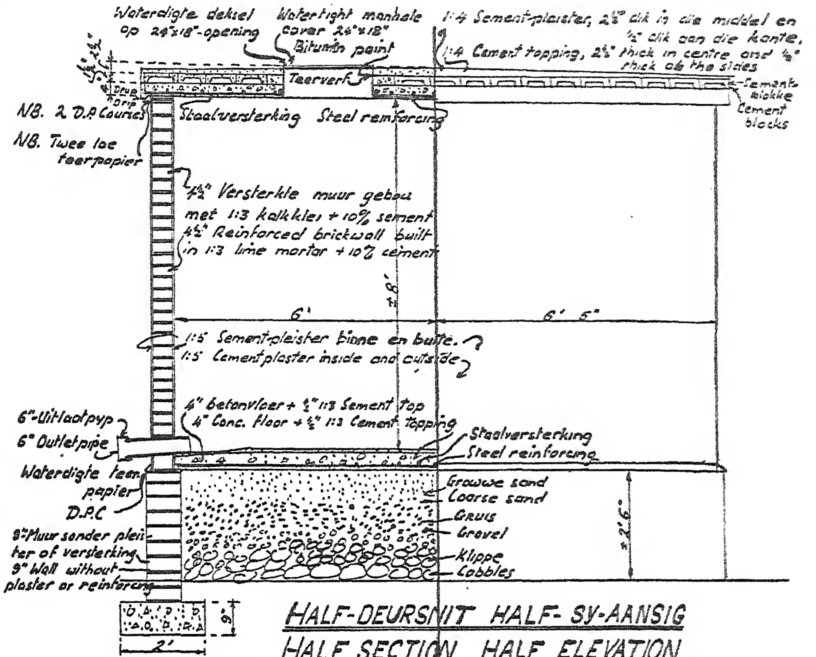
The space under the floor is filled up as follows:—A layer of stones followed by a layer of gravel and a layer of sand. This filling will prevent moisture rising from the ground.

Before the floor is cast, a layer of damp-proof coursing is placed on the 9-inch foundation wall. The floor is 4½ inches thick. The lower 4 inches are concrete consisting of 6 parts of broken stone, 4 parts of sand and 1 part of cement. If there is any possibility that the filling under the floor may cave in, the floor must be reinforced as shown on the diagram. If the filling is rammed down very firmly, the floor may be cast without reinforcement. The 4 inch concrete slab is covered with a ½-inch layer of cement topping consisting of 1 part of cement to 3 parts of clean sand.

A hollow is made in the floor, just where the outlet pipe passes through the wall. This outlet pipe has an internal diameter of 6 inches. In order to make it insect-proof, a socket is screwed onto the outside. This socket is covered on the outside with an iron disc welded to it.

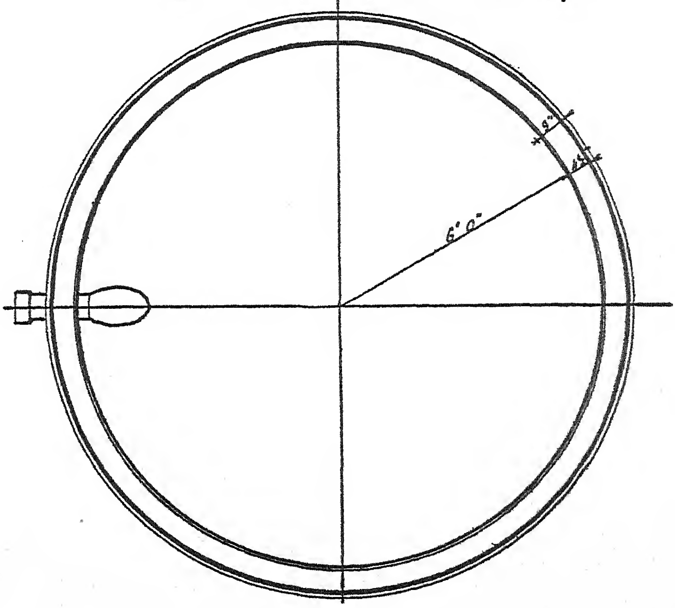
Walls and Reinforcement.

The actual walls of the tank are half a brick wide and are reinforced with No. 8 or No. 12½ high strain wire. The bricks are laid in lime mortar consisting of 3 parts of sand and 1 part of lime plus a quantity of cement equal to 10 per cent. of the lime. The



HALF-DEURSNIT HALF-SY-AANSIG

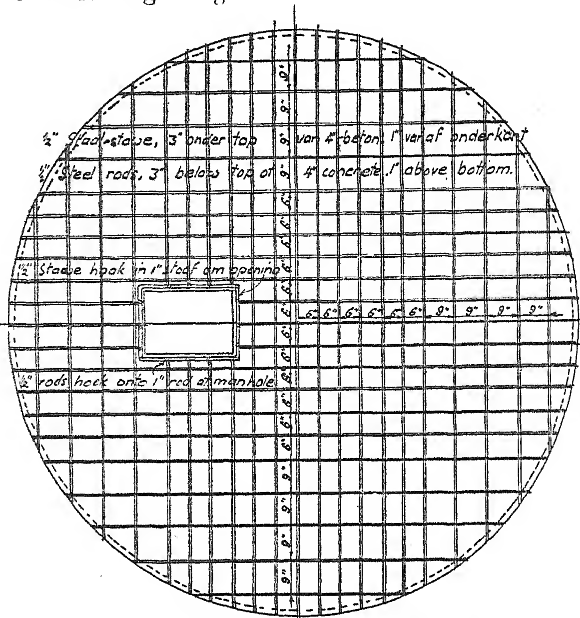
HALF SECTION HALF ELEVATION



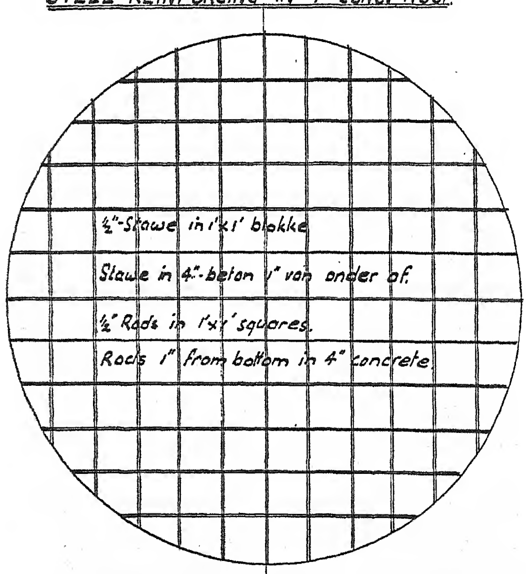
PLAN

reinforcing wires are firmly fastened round the wall after it has been built and before it is plastered.

The wire may be put round in one piece. A peg is fixed at the bottom of the wall and the wire fastened to this. The wire is then strained round and round the tank by three or four men. One man sees that the spacing round the wall is correct, viz., one winding at each of the following heights above floor level: 3 in.; 9 in.;



STAAL-VERSTERKING IN 4"-BETON-DAK.
STEEL REINFORCING IN 4" CONC. ROOF



STAAL-VERSTERKING IN VLOER
STEEL REINFORCING IN FLOOR

1 ft. 3 in.; 2 ft. 3 in.; 2 ft. 9 in.; 3 ft. 6 in.; 4 ft. 6 in.; 5 ft. 6 in.; 6 ft. 6 in.; 7 ft. 6 in.; 7 ft. 10 in.; and 7 ft. 11 in.

Roof.

Before the roof is put on, two layers of damp-proof coursing are placed on top of the wall to allow the roof to expand and to shrink. The actual roof is cast from concrete consisting of 4 parts of broken stone, 3 parts of sand and 1 part of cement, and is reinforced as shown in the diagrams.

The shuttering on which the concrete is cast, must be at least 1½ inches thick and must be supported every 2 ft. in the length of the boards. The inexperienced builder may have some difficulty in erecting the shuttering. The roof should extend slightly beyond the wall to form an eave with drip. A ring made from plywood may serve as a form to keep the 4-inch layer of wet concrete on the shuttering and on the wall. The concrete should be firmly rammed down around the previously constructed reinforcing grid.

On the concrete roof a number of cement blocks or strips, channel shaped in section, are placed as shown in the diagram. Cement plaster is worked into the joints between the blocks with a trowel.

The blocks may also be laid in cement plaster. On top the blocks are painted with a thick layer of bitumen paint sprinkled with coarse sand. The bitumen paint is now covered with a top layer of cement plaster consisting of 4 parts of sand and 1 part of cement. The layer is 2½ inches thick in the centre and falls to a thickness of ½ inch at the sides.

The cement blocks serve to insulate the roof against the heat of the sun and the idea is that this insulation will prevent the top maize from becoming mouldy. The brick walls which are plastered on the inside and outside with a mixture of 1 part of cement and 5 parts of sand will insulate the sides. Extra safety will be ensured, however, if the tank is placed in the shade of trees.

The opening of 2 ft. × 18 inches in the roof must be tightly closed and the best plan is to buy a ready-made manhole cover of the correct size for this opening.

Material.

The following is a list of the materials required and the approximate costs.

	£.	s.	d.
2,500 hard bricks	10	0	0
2 cubic yards 2-inch ring crushed concrete stone (foundations)	1	10	0
3 cubic yards 1-inch crushed concrete stone	2	5	0
450 lb. ½-inch steel for reinforcement	5	12	6
5 cubic yards concrete sand	2	10	0
1 cubic yard plaster sand	0	10	0
1 cubic yard building sand	0	10	0
17 (180 lb.) bags of cement	6	7	6
1½ bags of lime	0	10	0
Manhole cover	1	5	0
Galvanized pipe, 2 ft. 6 in. plus socket	0	15	0
¼ roll 2-ply D.P.C.	0	10	0
1 gallon bitumen paint	0	10	0
½ roll No. 8 wire	1	0	0
Wood for scaffolding and forms, about	7	10	0
Labour, about	18	15	0
TOTAL	£60	0	0

Concentrates for Dairy Cows.

L. J. Veenstra, Superintendent of Dairying.

ALTHOUGH there is no reason at present to fear any shortage of stock-feed during the winter months, it may be pointed out, that concentrates must in any case be used judiciously in order to avoid waste.

The word waste is here used not only in the literal sense, but also to indicate the uneconomic use of concentrates for which the farmer has to pay a high price to-day.

Even in times of plenty, there should be no waste but as is often the case with a farmer who loves his animals, he will feed even those which he knows are unprofitable.

When the total amount of available concentrates is small or limited, however, the position is different.

If the concentrate ration of a high-producing cow is reduced in order to share with the low producers, the production of the herd as a whole will fall. Since a milk shortage is expected during the winter months, the dairy farmer must do all he can to ensure the highest total production of his herd.

Apart for the food needed for maintenance of the body and for repairing the wear and tear which is continually taking place, a dairy cow needs a certain amount of various food constituents from which to produce milk. Under normal conditions the animal can draw sufficient nourishment from the ordinary feed harvested on most farms, such as various types of hay, silage, green winter feed, turnips, pumpkins, etc., to keep in good condition and even to produce a small quantity of milk. During the summer months, cows will be able to yield 20 lb. of milk or more per day without receiving any concentrates, but during winter this will not be the case unless the quality of the roughage is very high, and sufficient quantities are obtainable. For want of hay rich in proteins, such as lucerne or bean hay, or high-protein silage, the milk yield will be very low unless sufficient quantities of concentrates are added.

Concentrates According to Production.

Research workers have determined how much concentrate feed of a certain composition a cow needs to enable her to produce an extra gallon of milk; but it has not yet been possible to determine beforehand whether she *will* be able to yield an extra gallon if she receives these concentrates. The concentrates which one cow utilizes for greater milk production, may be utilized by another to form meat and fat. Since concentrates are expensive and not very plentiful to-day, it is undesirable to use them for turning poor dairy cows into slaughter cows.

In order to obtain the best results, the farmer must know when every cow in his stable reaches the height of economic milk production, beyond which point an increase of concentrates would involve financial loss.

The owner should therefore carefully control the amount of feed given to each cow, and should keep an individual record of their milk production.

 [*Continued on page 424.*

Dryland Lucerne in the South-Eastern Orange Free State.

O. S. Heyns, Extension Officer, Zastron.

IN the grain districts of the western Cape Province, the deterioration of lands has become such a serious problem that a crop had to be found which could be used not only for profitable cultivation but also for restoring soil fertility. The solution to the problem was found in the dryland cultivation of lucerne from which the soil profited both physically and chemically. Not only was a higher yield obtained from cereals following on lucerne, but the stimulating effect of lucerne on the soil also lasted longer than that of fertilizer and, in addition, left the soil in a better physical condition.

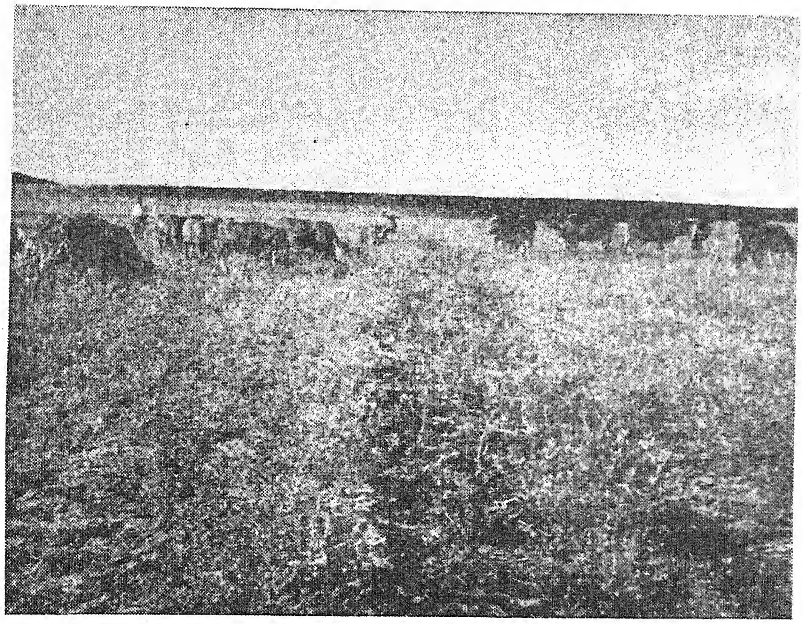


FIG. 1.—Photograph showing flat contour bank, hardly discernible but extremely effective.

Although the soils of the Orange Free State have been under cultivation for a much shorter period than those of the western Cape Province, the continuous cultivation of maize and/or winter cereals without supplementing the reserves of organic matter in the soil and/or cultivating a good resting crop, is causing exhaustion and deterioration of the soil to the same extent as in the western Cape Province. Lucerne can also be cultivated very successfully under dryland conditions in the Orange Free State and therefore offers a solution to this threatening problem of soil exhaustion and deterioration. It would be advisable to check this evil in time by making use of this valuable crop.

In 1944 the Department of Agriculture introduced a lucerne subsidy scheme under which a subsidy of 60 per cent. is paid on

the purchase price of approved lucerne seed, and a special permit granted for super-phosphate. Before a subsidy is granted, the farmer must make formal application, whereupon officers of the Department inspect the soil in order to determine whether it will be suitable for dryland lucerne and in order to advise the farmer in connection with the preparation of the soil, the method of sowing and the management of lucerne in general.

Soil and Fertilization.

The soils of the south-eastern Orange Free State are derived mainly from dolerite and sandstone. As a rule, dolerite soil is a red, clayey loam, containing a considerable admixture of lime, but poor in phosphates. Sandstone soils, on the other hand, are of a sandy loam type, poor in both lime and phosphates. It is clear, therefore, that both these soil types require good phosphatic fertilizer for the successful cultivation of dryland lucerne, and the optimal application should not be less than 400 lb. super-phosphate per morgen. Since phosphates do not move in the soil and since lucerne is a crop with a deep root system, it is essential that the phosphates should be ploughed in deeply before the lucerne is sown.

Since dolerite soils are fairly rich in calcium, they do not require extra fertilization with lime. Sandy soils, however, are acid and poor in lime. For the successful cultivation of lucerne on these sandstone soils, a fairly heavy application of at least two tons of agricultural lime per morgen is absolutely essential. Agricultural lime is the most economical form as well as the cheapest in which lime can be applied. Lime not only neutralizes soil acidity but also stimulates the growth of lucerne and improves its nutritive value and palatability. The agricultural lime should also be applied before the lucerne is sown, and should preferably be ploughed in deeply. On the farm Waterloo in the Zastron district, where a whole-farm demonstration is being carried out, dryland lucerne was sown on sandy soil which had previously received two tons of agricultural lime per morgen. The lucerne showed much better growth at a very early stage and was less severely damaged by frost than other lucerne which did not receive lime.

Preparation of the Soil.

It is advisable to sow dryland lucerne in early autumn, and consequently there is ample opportunity during the previous summer for thorough preparation of the soil. No other crop should be cultivated on the soil shortly before the lucerne is sown. During the previous summer the soil must be ploughed thoroughly, twice if possible, and repeatedly harrowed in order to obtain a fine seedbed and to destroy weeds.

Another important factor in the preparation of the soil is adequate protection against soil erosion. It is clear, of course, that once the lucerne has been established, it is extremely difficult or even impossible to apply soil conservation measures. Although the lucerne will afford adequate protection against soil erosion once it is established, it cannot do this in its early stages, and it is therefore advisable to make contour banks previously in order to protect the crop against heavy downpours, especially on sloping ground (see fig. 1).

Time of Sowing, and Sowing Methods.

As mentioned before, autumn is the best time for sowing lucerne, viz. in March, since the season is then too far advanced for the germination of most weed seeds. The lucerne will, therefore, be able to become well established during the following winter and

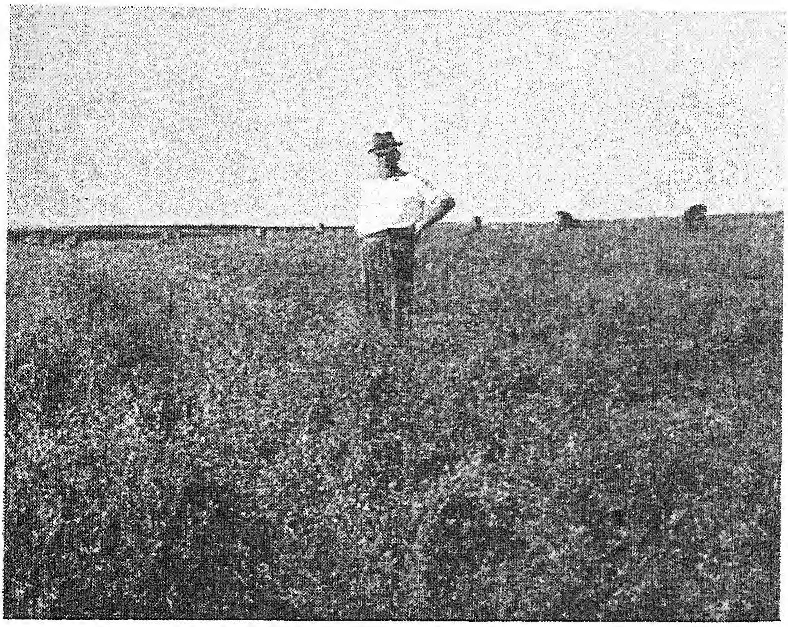


FIG. 2.—Lucerne, showing stand obtained with four inches of rain since sowing.

to develop a strong root system. With the first summer rains, the crop will have a good start and be able to oust any weeds. The accompanying photo (fig. 2) taken on 4 January, 1946, shows lucerne planted during the previous autumn. It grew luxuriantly with only four inches of rain since the date of sowing.

The best method of sowing is to use a hand broadcasting machine or a wheelbarrow type of planter. Care should be taken, however, to ensure continuous planting, otherwise bare patches will occur in the stand. Another method is to mix the seed with fertilizer and then sow it through the fertilizer hopper of a wheat planter. See that the fertilizer pipes are lifted out, however, and that the seed is scattered evenly over the ground.

Like all other fine seeds, lucerne seed should be covered lightly, a light harrow or branches tied to a light beam, being used for the purpose. A practical hint for sowing lucerne seed with the hand broadcasting machine is to attach an additional temporary seat to the tractor on which the sower can sit with his back to the tractor. The person operating the hand broadcasting machine broadcasts the seed in the opposite direction to that in which the tractor is moving, scattering it in front of or over the harrow or branches following the tractor. Fig. 3 clearly showing the tracks of the

tractor, illustrates very well that lucerne requires a firm seedbed, because the best stand was obtained in those tracks. This proves the desirability of rolling the land after sowing, and for this purpose a proper roller, if available, is the best implement. Its use ensures close contact between weed and soil and optimal germination. Rolling the land does not form a crust through which the seedlings have to struggle.

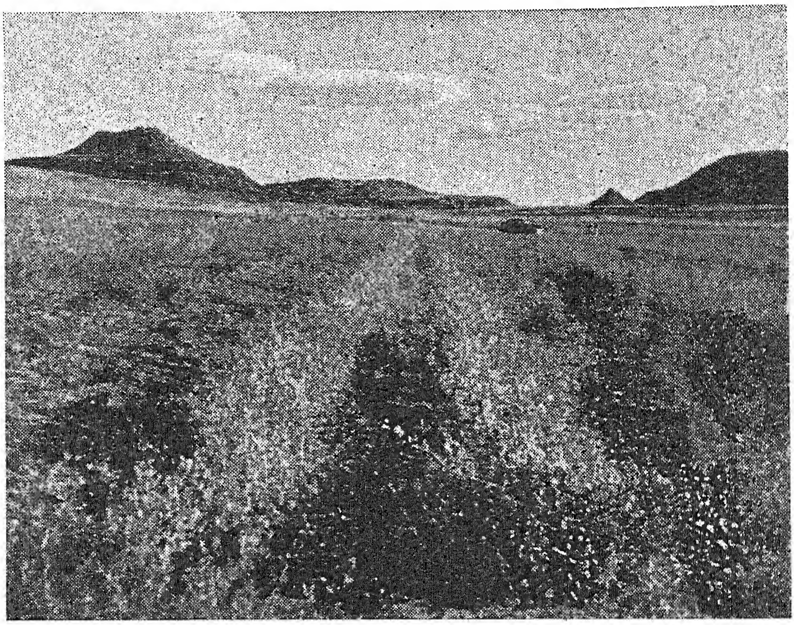


Fig. 3.—Photograph showing better stand on tractor tracks.

In the eastern Free State the rate of seeding is about 30 lb. per morgen and it is usually estimated that a 200 lb. bag of seed will be sufficient for six morgen. Only two varieties are recommended, viz. Hunter's River and Provence, and there is very little difference between the two. In some areas farmers are advised to sow the lucerne together with a winter cereal which serves as a foster crop. In the Orange Free State, however, this practice is definitely not recommended since root competition for moisture may be too strong for the young lucerne during the dry winter months.

Since the Orange Free State is a grass area with no indigenous clover of any kind, the soil contains no nitrogen-fixing bacteria. It is, therefore, essential that the seed should be inoculated beforehand with the necessary nodule-forming bacteria, obtainable from any seed merchant. They are inexpensive and their use is strongly recommended.

Every Merino Sheep is Important.

N. G. Wessels and P. G. Neethling, Sheep and Wool Officers,
Grootfontein College of Agriculture.

FROM a distance any forest usually looks very attractive and uniform, but on closer inspection it becomes clear that the wood is composed of a great variety of trees, some large and others small, some well developed and others stunted and puny.

This is also true of many a flock of merino sheep, which as a flock is not bad and leaves the owner well satisfied with the condition of his animals. On the whole, the wool yield may be good and not below average for the area. Wool prices may be satisfactory, the animals generally of good size and even the lambing percentage of good average.

The flock as a unit can therefore be regarded as quite normal, and even the owner may be satisfied with this state of affairs.

As in the case of a forest, however, closer investigation, especially a comparison of individual sheep, will reveal little uniformity, for scattered amongst the good animals, there will be many extremely inferior individuals. Although the good sheep compensate for the poorer animals and ensure a satisfactory average for the flock, the general level can be raised considerably by means of culling.

Recently the lambing percentage has been generally poor. Fertility is certainly one of the most important factors in successful animal breeding and every farmer knows that he must do everything in his power to secure high lambing percentages. Undoubtedly very few, if any, merino breeders can boast of a lambing percentage of 100, and yet many breeders of British breeds and Blackhead Persians obtain up to 150 lambs per year per 100 ewes.

Even amongst merino ewes there are individuals which lamb regularly each year, and many which produce twins every year.

At the Grootfontein College of Agriculture a unique case was recorded of a merino ewe, D.B. 286, which lambed regularly for 10 successive years and produced a total of 20 lambs, viz. 8 pairs of twins, 1 set of triplets and 1 single lamb. In this same flock, as well as in many others, there are several ewes which have produced 12 and more lambs during a period of 10 years. In a flock consisting of such individuals it will not be difficult to obtain a lamb crop of 100 per cent. or even more. In contrast to these, there is the case of D.B. 919 which lambed for the first time at the age of three years and then skipped two years, before lambing again; and D.B. 924 which was culled from the flock at the age of 5 years because she had not lambed yet.

As regards wool production, there are great individual differences even amongst sheep kept under similar conditions. An average wool production of 9 lb. is regarded as reasonably good for a flock, but in order to attain this average production, some ewes must produce 12 lb. and over, whilst others in the same flock yield only 5 and 6 lb. under the same conditions. Of course, the ewe which lambs regularly cannot be expected to have a high wool production, although there are such cases, such as D.B. 435 which produced 7 lambs over a period of 6 years at the end of which she yielded 7 lb. of scoured long staple medium wool, i.e. 12½ lb. of light greasy wool. There

are many similar ewes in every flock. The low producers not only produce less wool, but in most cases shorter wool, which yields less per pound.

The same wide individual differences are found if other economic factors such as milk production, susceptibility to blow-fly strike, size, etc., are taken into account. In every flock there are ewes which are well able to raise their twin lambs, whereas others, under the same conditions, have not got sufficient milk for one. Some ewes must be regularly treated for blow-fly strike, whereas others are seldom or never attacked.

From the foregoing it is clear that although a farmer can be fairly well satisfied with the average of his flock if regarded superficially, this average may be increased by looking upon his flock as a unit composed of individuals, of which many are far above the average. Each individual must be taken into account, and no farmer should be satisfied with an average. If our breeders could succeed in building up merino flocks composed entirely of outstanding individuals, it will be unnecessary to introduce foreign blood in order to put our sheep-farming industry on a sound and profitable basis; in other words, their future will be assured.

Concentrates for Dairy Cows :—

[*Continued from page* 418.

In many stables such records are kept, but in others again the cows are just fed in the hope that they will receive the correct quantity; consequently many dairy cows do not receive sufficient concentrates whereas others receive far too much.

There is a possibility of a future shortage of certain types of concentrates, and prices will rise. Therefore it is now the time for the farmer to inspect his herd. Animals which are unprofitable as dairy cows must be sent to the abattoir as soon as possible.

If this is not done, the farmer must at least see that all unprofitable animals are culled before the winter.

Nursery Quarantines.

The following nursery quarantines were in force on 1 May 1947:—

Municipal Nursery, St. George's Park, Port Elizabeth, on privets, bay, ekebergias and pecans (all), for red scale.

Ticks and Tick-borne Diseases.

Part II.—Control Measures.*

R. du Toit, Veterinary Research Officer, Onderstepoort.

IN general, all control measures aim at destroying the species of tick to be dealt with at the most vulnerable stage or period of its development. Casual or intermittent feeders whose habit it is to feed at a time when the host is at rest, generally at night, are best attacked when they themselves are resting in their lurking places. Those species which remain attached to their hosts for long periods at a time are best attacked on their hosts, but the host itself will often determine the nature of the treatment to be applied, and it is therefore almost impossible to generalize regarding control measures except in a comparatively few instances.

Control measures may be divied into three main categories, as follows:—

(1) Quarantine or isolation of animals harbouring or suspected of harbouring ticks, with the object of allowing these ticks to complete their engorgement and leave their hosts, thus eliminating the chance of clean animals becoming infected.

(2) Destruction of ticks in places of concealment away from their hosts. This involves the use of insecticidal sprays, fumigation, burning, etc.

(3) Destruction of ticks upon their hosts. This involves dipping, application of insecticides by spraying, hand-dressing, dusting, etc.

Quarantine or Temporary Isolation of Introduced Animals.

This most necessary step, when introducing new animals, is only too often neglected due to lack of provision for suitable quarantine space, casualness, etc., and has led to the introduction of several species of ticks into the Union from overseas and the dissemination over wide areas of species not normally present. Quarantine measures are naturally applicable to all species of ticks, but a few instances may be cited where enormous financial loss may result from failure to observe this fundamental principle with the introduction of animals. The *fowl tick* (*Argas persicus*), although not a permanent parasite in its nymphal and adult stages, remains attached to its host as a larva for periods of up to 10 days, in which stage it is generally transported from place to place. If provision is made to keep introduced fowls in the crates in which they came or some other suitable place for 10 days before allowing them to mix with the rest of the birds on the property, a great deal of economic loss due to spirochaetosis and subsequent labour in eradicating the ticks may be averted. The *spinose ear tick* (*Argas megnini*) owes its introduction from America and subsequent spread in this country to failure to observe precautionary quarantine measures. Although capable of persisting in the ears of stock as larvae and nymphs for very long periods, a comparatively short quarantine period during which the ears should be examined and, if necessary, treated to kill the tick, would eliminate all possibility of introduction of the species. Heartwater in cattle and sheep is frequently introduced on to " clean " farms by means of animals harbouring infected larvae or nymphae of the bont tick,

* See article on Ticks and Tick-borne Diseases in the March, 1947, issue of this Journal

which, being of small size, are not easily observed. It is frequently not realized that the adults of this tick, which are easily seen, are not a potential source of danger so far as the introduction of the disease is concerned, as the adult females after dropping from the host do not feed again but lay eggs which give rise to uninfected larvae.

Destruction of Ticks away from their Hosts.

This method embodies the principles of burning, disinfestation by spraying, etc., and starvation of the parasites.

The *Argasidae*, which are typically rapid feeders and remain on their hosts for short periods at a time, are best destroyed by burning their places of concealment, if combustible, e.g., old fowl runs, crates, etc., in the case of the fowl tick, packing brushwood against kraal walls, etc., and burning this, in the case of the larvae and adults of the spinose ear tick, or spraying the places of concealment, such as cracks and crevices in walls, with some suitable insecticide, in the case of the human tampan.

Spraying Materials Suitable for Use Against Ticks.

Paraffin soap emulsion.—This spray is cheap, effective and easy to make, and may be prepared as follows:—

Dissolve 1 lb. of cut up yellow soap in 2 gallons hot water. Add with vigorous agitation 2 gallons paraffin until the liquid assumes a white creamy appearance. This forms a stock emulsion which for use is diluted with 6 parts of water. Soft water should be used for preference as hard water tends to cause the emulsion to break up on dilution. This may be overcome to some extent by increasing the amount of soap. The efficacy of this spray is greatly increased if ¼ pint of 40 per cent. tobacco extract (nicotine sulphate) is added to the stock emulsion which, upon dilution, gives roughly a 0·05 per cent. solution of nicotine sulphate.

Paradichlorbenzene-paraffin spray.—1½ lb. paradichlorbenzene dissolved in 1 gallon paraffin has been found to give a spray which is particularly effective against resistant species such as the human tampan in buildings.

Pyrethrum spray.—This consists of the extract of the flowers of the pyrethrum plant dissolved in paraffin and, although a rough extract may be prepared at home, is generally more conveniently bought ready made. Many proprietary preparations are obtainable. This spray is extremely effective against ticks in buildings and other places of concealment.

Carbolic and coal tar derivative sprays.—There are many such sprays on the market, many of which are sold as dips or disinfectants. These are diluted with water according to the directions of the manufacturers and are effective against ticks at the correct concentrations.

Destruction of Ticks upon their Hosts.

Dipping or the immersion of animals in an insecticidal solution is the most widely used method for destruction of ticks on animals. In its wider sense it includes the use of sprays, hand-dressing materials and dusts.

In South Africa arsenic in the form of sodium arsenite, which is a white powder but, in accordance with Government regulations, must be coloured blue to avoid confusion with other white substances,

is generally used in a watery solution for dipping purposes. Although in itself an extremely poisonous substance, it is used with impunity if the recommended dilutions and instructions for its use are complied with. For the destruction of the different species of ticks different dilutions and different intervals at which animals should be dipped are prescribed, these being based upon the periods the particular species of tick remains upon its host.

In practice only 7 and 14-day-interval dipping is adhered to these days, the 7-day period being designed for all two and three-host species such as the red tick, bont-legged tick, the brown ticks and the bont tick, and the 14-day interval for the single host species, such as the blue tick and Argentine tick. The 7-day-interval dip contains 0·16 per cent. arsenic (As_2O_3) or 2 lb. sodium arsenite per 100 gallons of water, and the 14-day-interval dip 0·24 per cent. arsenic (As_2O_3) or 3 lb. sodium arsenite per 100 gallons of water. Previously a 3-day-interval dip containing 0·08 per cent. As_2O_3 or 1 lb. sodium arsenite per 100 gallons of water was prescribed for the control of the brown tick, principally in the case of outbreaks of East Coast Fever, as the immature stages of this species may complete their engorgement upon cattle within 3 to 4 days. It has been found in practice, however, that dipping cattle at 5-day intervals in a 7-day-strength dip (0·16 per cent. As_2O_3) gives better results as the 3-day strength is rather too low to be really effective and 3-day-interval dipping has been discontinued. For convenience sake, dipping is generally carried out at intervals of 5, 5 and 4 days until the mortality due to East Coast Fever ceases. By this method every third dipping falls on the same day of the week as that commenced with.

As there is a general tendency to slacken off with dipping during the colder winter months, when tick life is at a low ebb, the most generally employed 7-day-strength dip may be applied with advantage at 14-day intervals during these months to control most tick species. In no case, however, should the strength of the dip exceed 0·24 per cent. As_2O_3 as the risk of scalding animals and poisoning becomes greatly increased.

It is unnecessary here to enlarge upon the practice of dipping, which has been fully dealt with in many departmental publications, but it cannot be over-emphasized that arsenic is an extremely poisonous substance and such precautions as (1) the watering of stock prior to dipping to minimize the danger of cattle drinking dipping fluid, (2) the provision of a well fenced-off area adjacent to the dipping tank into which the dipping fluid may be poured when cleaning the tank becomes necessary, and (3) the proper disposal of all containers in which arsenic was stored, are essentials which, if strictly adhered to, would do much towards reducing the appalling mortality in livestock due to arsenical poisoning which occurs annually in South Africa.

Proprietary Dips.—There are a large number of proprietary arsenical dips available, which contain arsenite of soda in dissolved form as the active ingredient. The usual concentration of sodium arsenite in such dips is 64 per cent. which, upon dilution at 1:800, 1:400 and 1:267 give the final concentrations for 3, 5-7 and 14-day dipping, which are prescribed by Government Notice. In a few instances where the sodium arsenite concentration is below 64 per cent. the makers' directions for dilution should be followed and these are such as to conform to the standards laid down.

Changes in the tank fluid.—The first consideration in the dipping of stock in sodium arsenite solutions is to maintain the dip at the correct strength. Overstrength dip is liable to scald animals, whereas, if the solution is understrength, it will fail to achieve the results desired. Under field conditions a number of factors operate which may be responsible for changes in the tank strength, e.g.:—

(*a*) Entry of water into the tank from rain, storm water, leaky taps, etc., will dilute the dip and reduce the concentration of sodium arsenite.

(*b*) Evaporation from the surface will increase the concentration.

(*c*) Chemical changes in the tank itself will either increase or, more frequently, reduce the apparent concentration of arsenite present.

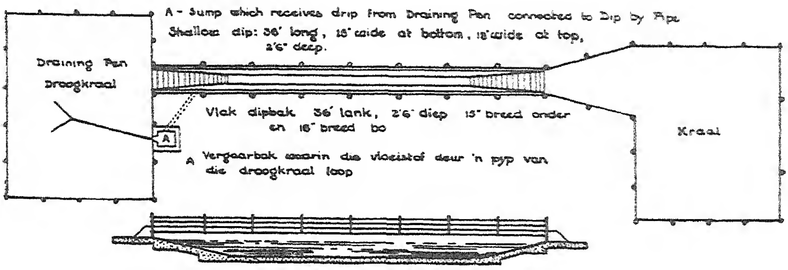
Chemical changes in arsenical dips are brought about by micro-organisms which are capable of either "oxidising" the arsenite to arsenate or bringing about the reverse change and "reducing" the arsenate to arsenite. In this way it is frequently observed, especially in dips which are seldom used or in which a few head of cattle only are dipped, that the concentration apparently decreases upon applying the usual test, which determines sodium arsenite only. If more sodium arsenite is added from time to time, to adjust this apparent understrength, severe scalding of stock may result, and when a test for *total arsenic* (i.e. arsenic present both as arsenite and arsenate) is made it is found that the tank is overstrength. The reverse is sometimes experienced when dipping is resumed after a period of idleness, such as after the winter, and, although the tank strength may have been adjusted at the recommencement of dipping, it is found to be considerably overstrength some weeks later without the addition of more sodium arsenite. The former change is due to the absence of a sufficient amount of organic matter in the tank, with the result that those organisms responsible for oxidation gain the upper hand, and may be remedied by the addition of a quantity of fresh cattle dung. In the latter case a portion of the tank fluid must be removed and water added to adjust the concentration of sodium arsenite.

Testing of the dip.—Dips should be tested at regular intervals to ensure that the correct concentration of sodium arsenite is maintained and for this purpose the Laboratory Dip Testing Outfit has been designed which is capable of testing either for sodium arsenite concentration or for total arsenic—the difference between the two readings giving the amount of arsenic present as arsenate in the tank. This outfit, together with full instructions, is obtainable from the Director of Veterinary Services, P.O. Onderstepoort.

The Foot-Dipping Tank.

A modification of the usual cattle types of dipping tank has been designed for use with sheep, which are infested with ticks, especially the paralysis tick. The accompanying sketch, gives details of the construction of the foot bath, which permits of sheep walking through it and thus covering the legs and undersurfaces of the body with the dip to destroy the ticks which occur in these situations. As previously pointed out, the paralysis tick occurs mostly in winter, when it is not advisable to

immerse sheep entirely in any dip. The usual 7-day concentration of sodium arsenite, run into the tank to a depth of 16 inches, is recommended for use with the foot bath.



The foot-dipping tank.

Spraying and Hand-dressing.

When a small number or animals only are to be treated for ticks and dipping is not practical, spraying with arsenical solutions at the above concentrations may be employed. The addition of nicotine sulphate (tobacco extract) to give a concentration of 0·04 per cent. greatly increases the efficiency of such sprays. If the 40 per cent. extract is employed 1 gallon to every 1,000 gallons dip or, in smaller quantities, 4·5 cc. or roughly 1½ teaspoonfuls per gallon, makes a solution of the correct strength. It frequently happens that due to fatty secretions and the inaccessibility of the parts, the dip does not penetrate and thoroughly wet the skin under the tail, in the brush or the inside of the ears, and in these situations it is necessary to apply hand-dressing materials. The following hand-dressing materials, which may be prepared at home, are recommended:—

Axle grease, 10 lb.; Stockholm tar, ½ lb.; arsenical dip containing 64 per cent. As_2O_3, 1 tablespoonful or ½ fluid ounce; 40 per cent. tobacco extract, 3 tablespoonfuls, or 1½ fluid ounces.

The arsenical dip and the tobacco extract should firstly be well mixed with the Stockholm tar and this mixture then stirred into the axle grease. This mixture is black in colour and somewhat dirty to use. If a cleaner material is required, e.g., for dairy cows, the axle grease and Stockholm tar may be replaced by the following: Water, 1 gallon; yellow soap, 1 lb.; suet fat, ½ lb.

Dissolve the soap (cut up into small pieces) in the water by heating and stir in the suet (previously melted) until the mixture becomes creamy. Allow to cool and stir in the other ingredients.

An effective hand-dressing preparation may be made by stirring into axle grease or vaseline a concentrated extract of pyrethrum. If the usual 2·5 per cent. extract is employed this is used in the proportion of 1 part to 15 or 20 parts grease.

In the case of the spinose ear tick the following mixture, which should be used only in the ears, as it is too irritating on other parts, has been found to give satisfactory results: Oil (old motor oil or cotton seed oil), 2 parts; Stockholm tar, 2 parts; turpentine, 1 part.

Table showing the more important South African ticks, together with the points of chief economic importance attaching to each, and indicating the control measures advocated.

Family or Group.	Tick Species.	Number of Hosts.	Disease Transmitted.	Parasite.	Disease occurs in	Control of ticks on domestic animals.
Argasidae.....	Fowl tampan.......... (*Argas persicus*)	Many	Spirochaetosis.......... Aegyptianellosis........	*Spirochaeta anserina*.... *Aegyptianella pullorum*..	Poultry........... Poultry...............	10-day quarantine and disinfection of premises.
	Spinose ear-tick........ (*Argas megnini*)	1	Nil.	Nil.	Cattle, sheep, horses, dogs, man, etc.	Treatment of ears and disinfection of premises.
	Human or eyeless tampan (*Argas moubata*)	Many	Relapsing fever......... Spirochaetosis..........	*Spirochaeta duttoni*...... *Spirochaeta anserina*....	Man.................. Poultry..............	Disinfection of premises.
Ixodidae......	Sheep paralysis tick.... (*Ixodes pilosus*)	3	Paralysis..............	—	Sheep and goats........	Foot bath.
	Bont-legged tick........ (*Hyalomma aegyptium* var. *impressum*)	2 or 3	Tick-bite fever.........	*Rickettsia* sp...........	Man..................	7-day dipping.
	Dog tick.............. (*Haemaphysalis leachi*)	3	Biliary fever.......... Tick-bite fever.........	*Piroplasma canis*....... *Rickettsia* sp...........	Dogs................. Man..................	Hand-dressing.
	Blue tick.............. (*Boophilus decoloratus*)	1	Redwater............. Gallsickness............ Tick-bite fever......... Spirochaetosis..........	*Piroplasma bigeminum*.. *Anaplasma marginale*... *Rickettsia* sp........... *Spirochaeta theileri*......	Cattle................ Cattle................ Man.................. Horses, sheep, cattle, goats..............	14-day dipping.
	Red tick.............. (*Rhipicephalus evertsi*)	2	Redwater............. East Coast fever....... Mild gallsickness........ Biliary fever........... Spirochaetosis..........	*Piroplasma bigeminum*.. *Theileria parva*......... *Theileria mutans*........ *Nuttallia equi*.......... *Spirochaeta theileri*......	Cattle................ Cattle................ Cattle................ Horses................ Cattle, horses, etc......	7-day dipping.
	Brown tick............ (*Rhipicephalus appendiculatus*)	3	East Coast fever....... Mild gallsickness........ Redwater............. Nairobi sheep disease... Louping ill............ Tick-bite fever.........	*Theileria parva*......... *Theileria mutans*........ *Piroplasma bigeminum*.. *Ultravisible virus*....... *Ultravisible virus*........ *Rickettsia* sp...........	Cattle................ Cattle................ Cattle................ Sheep and goats....... Sheep, horses and cattle Man..................	5 to 7-day dipping.
	Black-pitted tick....... (*Rhipicephalus simus*)	3	East Coast fever....... Gallsickness............	*Theileria parva*......... *Anaplasma marginale*...	Cattle................ Cattle................	5 to 7-day dipping.
	Tropical dog tick....... (*Rhipicephalus sanguineus*)	3	Biliary fever........... Gallsickness............ Rickettsiosis........... Tick-bite fever.........	*Piroplasma canis*....... *Anaplasma marginale*... *Rickettsia canis*......... *Rickettsia* sp........... *Hepatozoon canis*.......	Dogs................. Cattle................ Dogs................. Man.................. Dogs.................	5 to 7-day dipping, hand-dressing.
	Bont tick............. (*Amblyomma hebraeum*)	3	Heartwater............ Tick-bite fever.........	*Rickettsia ruminantium*.. *Rickettsia* sp...........	Cattle, sheep, goats.... Man..................	5 to 7-day dipping.

The New Synthetic Insecticides as Tick-Destroying Agents.

The appearance during the war years of several synthetic insecticides amongst which the para-para isomer of D.D.T. (dichloro-diphenyl-trichlorethane) and the gamma isomer of 666 (benzene hexachloride) have been given the greatest prominence, has aroused considerable interest in the possible use of these substances for the control of ticks. A period of several years, during which their use under varying conditions is closely studied, will, however, probably have to elapse before any final conclusions can be arrived at.

As both these substances are insoluble in water, their incorporation into dipping tanks presents certain difficulties. Tests under field conditions, in which they are being used for dipping purposes either in emulsion form or in fine particle form suspended in water, have yielded promising results to date . The question of their permanence or lasting properties is being investigated, but more time is required before any authoritative statement can be issued and final recommendations made regarding their use as dips.

As sprays on animals for the control of ticks where freshly prepared emulsions or suspensions are employed, the results obtained appear to justify their recommendation for this purpose. D.D.T. is best employed in emulsion form at a final dilution of 2 per cent. or even 1 per cent. of the para-para isomer. Several such concentrated emulsions or water-miscible oils are obtainable which may be diluted or emulsified with water to give the final concentration required. 666 may be similarly employed at a final concentration of 0·02 per cent. to 0·01 per cent. of the gamma isomer. The concentrations suggested are tentative at this stage, but as further information regarding their use is accumulated recommendations will be made in Departmental publications.

In conclusion it should again be emphasized that although the methodical and continued application of the measures recommended by the Department of Agriculture for the control of ticks may to many appear tedious, the labour involved will be amply repaid in the form of increased yields from livestock.

New Bulletins.

The undermentioned Bulletin has recently been published:—

No. 249. Winter Pruning and Trellising of Vines. Price 3d.

A Brief Review of Rinderpest in Africa.

R. A. Alexander, Division of Veterinary Services.

HISTORY shows that one of the aftermaths of war is the spread of infectious diseases. Of the diseases of cattle, rinderpest is one which has consistently taken a heavy toll. Fortunately science has been responsible for the development of methods of control which have materially reduced losses when efficiently applied. The war through which the world has just passed, has been no exception. Rinderpest has broken out in Greece and in Egypt, but in the case of Egypt facilities were available to bring it under control.

In the Central African states, notably Tanganyika and Kenya, rinderpest is always present in cattle or game or both. Due to their uncontrolled movement, game are chiefly responsible for the continued spread of the disease, and care must always be taken that the disease does not spread to the more thickly populated areas to the south. Although it is the aim of the responsible authorities to eliminate all infection from Central Africa, the central railway line to Dar-es-Salaam is regarded as the southern boundary below which infection must not be allowed to spread. When the disease crossed this boundary in 1939, the Southern African states (Union of S.A., S. Rhodesia, N. Rhodesia and Nyasaland) after consultation agreed to assist the Tanganyika authorities, both financially and by the provision of equipment and trained staff, to stamp out infection and drive it north beyond the railway line. Full details of the technical aspect of the work carried out by the unit provided by the Union Veterinary Department will be found in various articles published in the Onderstepoort Journal. The campaign was a success. The disease was driven back a total distance of some 300 miles and during the past 18 months only one minor outbreak, easily controlled, has occurred south of the railway line.

To obviate any possibility of a future spread to the south, not only has a belt of immunized cattle been maintained right across Tanganyika, but a game fence, supported by a trench to exclude wild pigs, was also erected between Lake Tanganyika and Lake Nyasa. In addition, a 20 mile wide game-free zone was maintained north of this barrier. Recently, however, it was decided that conditions had so improved that these extreme precautions could be relaxed. The game fence which has been allowed to fall into disrepair, is being maintained along the northern inter-territorial border of Northern Rhodesia. Nyasaland has undertaken to provide this service from her own resources. Along the rest of the border a special game intelligence service will be maintained to keep a close watch on the game, their movements and any disease that may appear. Towards the cost of this service the Union has agreed to contribute 5/10ths, Southern Rhodesia 3/10ths and Northern Rhodesia 2/10ths. In addition, each state is expected to honour its obligation to control and, if possible, to suppress any disease within its own boundaries. By these measures it is expected that rinderpest will be kept within bounds. At least the southern states will receive timely warning of the approach of rinderpest, when other and more energetic measures will have to be brought into operation immediately. This is a responsibility which the Veterinary Department must be prepared to shoulder at any time and at a moment's notice.

Yema Graft of the Vine.

M. S. le Roux, Western Province Fruit Research Station, Stellenbosch.

BUDDING is a well-known practice in South Africa in the propagation of fruit trees and shrubs, such as citrus trees and rosebushes, but it has seldom been applied to the vine in this country. In California, Australia and parts of Europe, however, it has gained considerable acceptance (1) and (2).

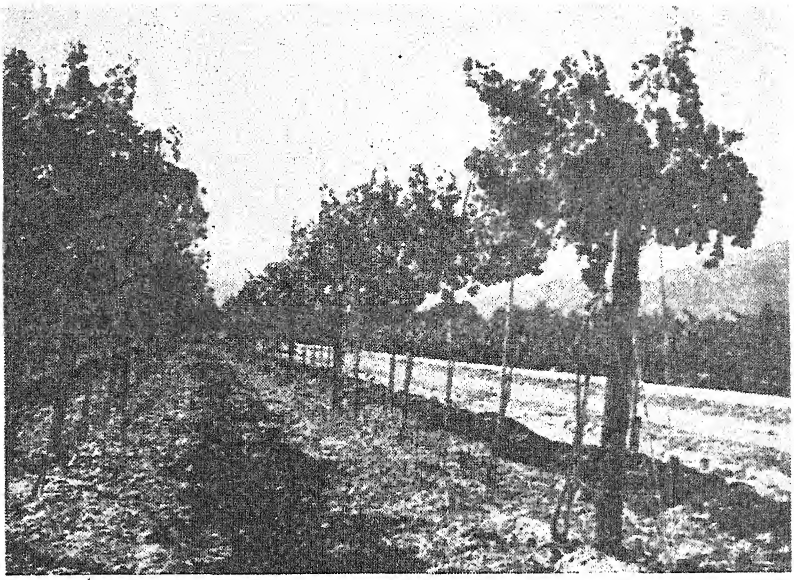


FIG. 1.—This uniform young vineyard on sandy soil at Bien Donné, was budded during February, 1945, onto rootstocks which had been transplanted seven months previously. Eighty-four per cent. of the buds became firmly established and sprouted during the spring of 1946. The remaining vines, as well as the small number which were too weak to bud, were grafted in the soil during that spring.

The budding of vines, or "yema" grafting, had its origin in Spain. The word "yema" means "bud" or "germ". The technique described here differs slightly from the Spanish method and also from the method of budding applied to fruit trees. The technique which was applied with some success on the experiment farm Bien Donné, is based on data furnished by a prisoner of war who came from an experimental farm near Rome.

Method of Budding.

Time.—As in the case of fruit trees, the vine is budded towards the end of summer, i.e. round about February. It is done at this time of the year to enable the bud to become firmly established during the rest of the summer without developing any further. If the budding is carried out too early during the season, the wood used will not be ripe and the budding will be a failure; if, on the other hand, budding is carried out too late, there will not be sufficient sap in the plant to enable the bud to grow firmly into the wood. The result will be a poor union or otherwise the bud will rot and die during the winter under the heap of clammy soil. In practice, the

best time to begin budding is as soon as shoots with a brown, hard rind are obtainable. Naturally, the exact date will vary according to the variety and the season.

Technique.—This is schematically explained in Fig. 2. The buds are cut from budwood which is considerably thinner than the rootstock to which they are to be grafted, since they fit better then. Good, ripe lateral shoots are best for this purpose and the buds are

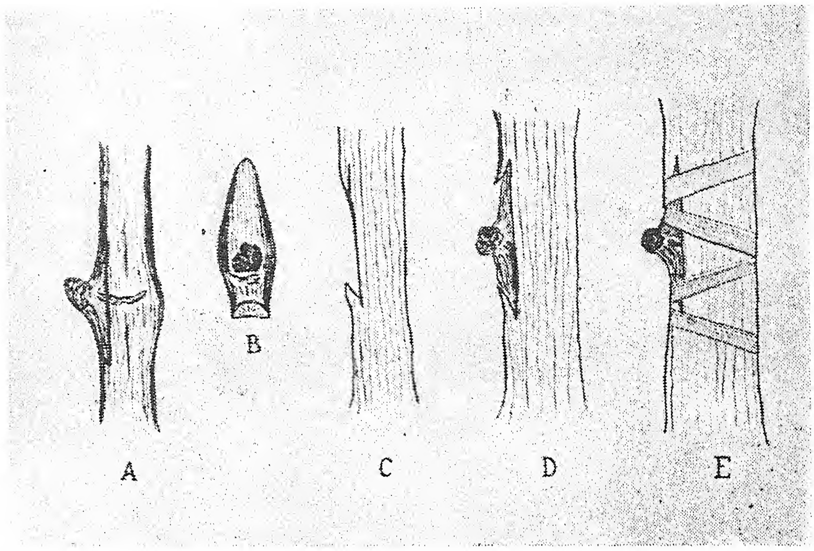


FIG. 2.—Representation of the process of budding: A, cultured shoot; B, shield with bud; C, the incision in the rootstock with flap on the upper side; D, the bud is inserted from the side (E), and securely tied with raffia.

carefully removed with a sharp knife. The knife must not tear into the wood. Only two incisions are necessary, viz. a vertical incision through the internode behind the bud and a short, horizontal incision below the bud to loosen it from the shoot (Fig. 2 A). In this manner a bud is obtained on a small and very thin shield of bark and wood (much thinner than the original Spanish "yema" graft) (Fig. 2 B.) When this has been done, the shield is less than an inch in length and only approximately one-eighth to three-sixteenths of an inch thick. The remains of the leafstalk on the bud are now carefully cut away.

A large number of these buds are cut in this manner somewhere in the shade of a vine and kept in damp cloths, since they easily dry out during this time of the year. The vines onto which the buds are grafted are rooted stocks which were planted out during the previous winter and have therefore been standing for only about seven months. Weak shoots are better left alone and grafted at a later date.

First of all the vines which are to be budded are opened slightly with a spade in order to facilitate the work. Budding is performed at the same height as grafting, i.e. about one or two inches above the soil surface. As a rule it is performed on that side of the vine containing the most shoots, since the flow of sap is stronger and the wood healthier in that portion. If any shoots are in the way, they

are cut off. One-third or more of the growth of the tips of the shoots is also cut away in order to supply the budwood with more sap so that the bud can become firmly attached.

The opening in the rootstock into which the bud must be inserted, is made in the original wood of the young rootstock. For this purpose, three incisions must be made, viz. two downward incisions, a short and a long one on any spot on the shoot, and then a shallow incision across the top (Fig. 2 C). Now a bud which will fit well is selected and inserted from the side so that it is firmly attached to the rootstock (Fig. 2 D). As in the case of grafting, it is extremely important here too that the cambium layer between the wood and the rind must stay in close contact with the cambium of the rootstock on at least one side. In order to ensure that this happens, the budwood is secured with raffia (Fig. 2 E.)

Now a strip of ordinary paper which is reasonably strong, is wound around the union. The paper is secured just above the bud by means of a single odd piece of raffia, so that it cannot shift. The bud and the bottom portions of the shoots are covered with a heap of damp soil approximately one foot high. The paper keeps the sand out of the union and the heap of soil protects the bud against drying out.

It is estimated that a trained person, working alone, can bud approximately four hundred vines per day.

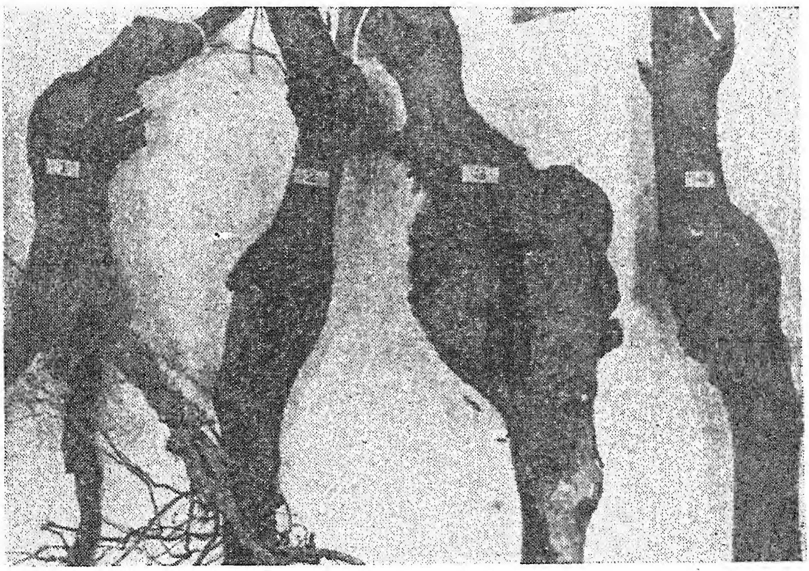


FIG. 3.—Ordinary soil grafting often results in poor unions, such as 1, 2 and 3 above. (In 1, the rootstock has completely vanished.) The nutrition of the vine is hampered by the imperfect graft union and its life is shortened.

Subsequent Care.

It is important that the vines should not be irrigated for the following three weeks, since too much moisture hampers the formation of wound tissue or callus.

After a month has elapsed, the vines are examined. As a rule, the raffia rots away of its own accord, but if it becomes too tight around the vine, it may eventually have to be removed. Early in

spring, before it becomes too hot, the buds are opened and inspected. Those which have become firmly attached can hardly be moved with the fingers. If the union has been successful, the vine is cut about two inches above the bud, since allowance must be made for a certain amount of dying-back in the healthy wood.

FIG. 4.—One of the Walthem Cross vines on Richter 99 vines in Fig. 1, seen at closer range. Note the healthy union obtained by budding.

The vine must be supported immediately and all superfluous wild shoots must regularly be cut away. In this manner all the sap is concentrated in the grafted bud. As soon as the weather becomes warmer, the bud develops so rapidly that it is a pleasure to watch its growth. In trellised vines the young growth soon reaches the wires, and the farmer must keep a watchful eye over the vigorous shoot and fasten it with raffia in order to prevent it from being blown about.

The shoots on which the buds have not grown securely, or which were too thin for budding, are topworked in the normal way by cleft grafting or tongue grafting, during the following spring.

In this manner a strong, vigorous and uniform vineyard with healthy unions is obtained.

Disadvantages of Budding.

(1) Generally speaking, hand grafting is satisfactory. The farmer buys the ready-grafted vines from the nurseryman. Actually, he need have no knowledge of propagation, or spend any

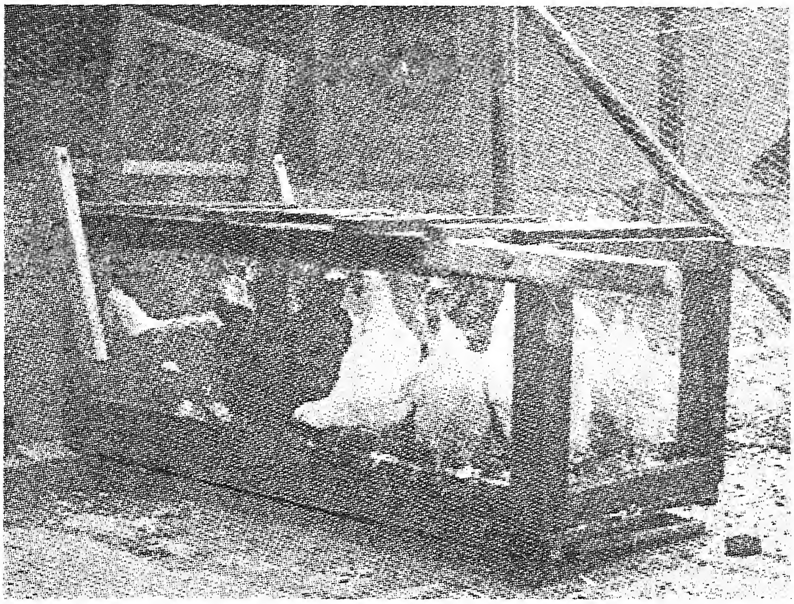
 [Continued on page 456.

Hints on Poultry Farming.

I. Factors in the Lay-out of a Poultry Farm.

E. F. Lombard, Professional Officer (Poultry), East London.

THERE are a number of important factors that must be carefully considered in the planning and lay-out of a poultry farm. In selecting the site, preference should be given to ground that slopes east or north-east, as such ground usually is well drained, and also dries off more quickly after rain than ground sloping in any other direction. A site that is level, or one that slopes towards the west, should be avoided, as the former lacks proper drainage and causes serious trouble due to dampness in the houses and runs, while the



Catching crate for handling hens.

latter will not receive much benefit from the morning sun, which is a very important factor, particularly during the winter months. A light sandy soil should be favoured, and, if at all possible, heavy and clayey soils which have slow drainage, should be avoided.

Since it is necessary to perform the daily routine work with the highest degree of efficiency and economy, the various buildings and runs should be so arranged as to make this possible. Where practicable, suitable labour-saving appliances should be employed. Doors and gates should be fitted with fasteners that secure then safely and are easily manipulated. For economy in labour it is necessary to provide food containers of such capacity that they need refilling only once or twice a week. A further advantage is to lay the water on in pipes to each group of birds, or otherwise, if that is not possible, to a few central points in the plant. All food and water containers, perches and nesting boxes must be portable to facilitate their quick removal and replacement for cleaning and repairs.

Since it is necessary, during the hatching and chicken season, to visit the incubator and the brooder houses frequently by day, and sometimes at night, these should be situated near the home. Discretion must, however, be used in the location of the chicken house and runs, because if these are too close to the home, the odours that may arise from them, may be objectionable. To rear chickens most successfully, there must be two separate systems of accommodation for them. For the first five to seven weeks of their life they are accommodated in a chicken house provided with small runs and furnished with some system of warm brooding. From there they are transferred either to colony houses on range, or to adult laying houses that have been prepared for their reception. In the latter event it is a great advantage to provide each house with two runs of fair dimensions. In this way the birds are kept on clean ground in one of the runs, while the other is cultivated to a crop to become clean again.

Where the laying birds have to be kept either on the intensive or the semi-intensive system, the long continuous type of house should be used. Such a house is most economically built with a depth of 18 feet, and, for convenience, should not exceed approximately 230 feet in length. Suitable heights are from 8 to 9 feet in front and 6 feet at the back. Allowing a floor area of 4 sq. feet per bird, the structure is divided with solid partitions into apartments, each to accommodate 150 hens. Such a house will take about 1,000 laying birds. If a larger flock is to be kept, another one or more houses may be erected parallel to and in line with it, allowing a vacant space of about 40 feet between the front of the one and the back of the other. This space is necessary to permit uninterrupted sunshine and ventilation into the houses and also to provide room for runs should these be required.

A room in which to mix and store feed should be erected at the most convenient spot from where the feed can be conveyed over the shortest possible distances to the various groups of birds. There is no advantage in having this room in the middle of a long laying house or the laying plant. In fact, such an arrangement is undesirable, as considerable disturbance of the birds results from the passing of vehicles and their attendants who periodically have to replenish the feed supplies. The egg room should be near the home and, for economy and coolness, may be added to the incubator room, the two apartments coming under one roof. Very careful attention to detail should be paid in the construction of these apartments in order to ensure suitable ventilation and an even temperature.

If small group matings of the breeding stock are not necessary, one or more sections in the laying houses may be used for large flock matings. Should the smaller group mating system be desired, the houses and runs are best situated behind the first row of laying houses. This will prevent disturbance and excitement of the laying flock. This section of the plant should be arranged systematically by placing the houses and runs in line and closing the dividing fences to a height of about 3 feet with some suitable material that will prevent the males fighting one another through the fences. The size of these houses will, of course, depend upon the number of birds they have to accommodate, but should in any case be large enough and be properly furnished to provide the maximum of comfort to their inmates. Since breeding birds occupy their quarters for only a few months in the year, the runs to these houses need not be large. If the double-run system is employed, these houses can, when vacated

by the breeding birds, be profitably used to accommodate cocks and cockerels that may have to be kept for future breeding. When chickens have to leave the brooder accommodation, whether they are put out in colony houses on free range or on the semi-intensive system, this department of the poultry farm should be situated on ground lying higher than that occupied by the adult flock. To prevent the birds in their wanderings from finding their way into the adult plant where they may pick up infection, the site for their occupation should be an adequate distance away. When chickens are transferred to a section of the laying houses, the section affording the highest-lying ground should be favoured.

A place of isolation, or hospital, is needed on every poultry farm and, to prevent infection spreading, should be situated at a safe distance from all the other departments. Although it may be of moderate dimensions, provision must be made to accommodate the inmates separately. If a shed is required in which to store vehicles and implements, it should be situated where the removal and replacement of these articles will not cause disturbance to the birds.

The most important factors in the construction of poultry plant are the suitability of the materials used and their economical use. The materials should be selected to ensure strength and durability of the finished buildings against wind and hail, to provide good cover from rain, and to offer the minimum harbouring place for parasites. All wood-work should be free of bark and be thoroughly treated with an insect-repellent fluid, of which there are several excellent preparations on the market. It is best to cover the floors with cement or some similar impervious material. Dressing the walls of the houses, inside and outside, with a mixture of lime and salt prepared to the consistency of cream not only improves the appearance of the buildings, but also closes cracks and small holes in which insects may harbour.

Belts of trees, of one or more varieties that are suited to the locality, should be planted where necessary to serve as wind-breaks to the plant and the birds. Trees should also be planted, for shade, in exposed runs and on open range, care being taken to select a variety that does not have rough or open bark.

It must be borne in mind that provision must also be made for the growing of an ample supply of green-feed, some of which can be cultivated in vacant poultry runs.

The construction of a satisfactory poultry plant involves considerable capital outlay, and it is therefore important to study economy in each item. There should be no hesitation about the use of suitable material that can be found locally and at lower cost.

A great saving is effected by applying the method known as "bagging" instead of plastering brick-work for smoothness.

It is usual to enclose the poultry runs with six-foot netting-wire. To achieve greater success in preventing the birds from flying over fences, two strands of plain wire are placed about four inches apart above the netting-wire, the lower one also being the same distance from the netting-wire. For this addition, the supporting poles must, of course, be about ten inches higher than those employed in a six-foot fence.

It is very strongly urged that, before the poultry plant is erected, application be made to the Editor of Publications, Department of Agriculture, Pretoria, for a list of bulletins and leaflets giving details, plans and illustrations of all the various necessary buildings and their furnishings.

II. Sanitation on the Poultry Farm.

The sunny and, in most parts, dry climate of South Africa is of great assistance to the poultryman in keeping his poultry plant clean and his birds in good health. Careful attention should therefore be paid to the structural details of the poultry houses which should be so constructed as to allow of free ventilation, but draughts must be avoided. Stuffy and draughty houses lower the resistance of the birds, rendering them susceptible to many ailments and diseases. The internal furnishings should be portable and be so placed as to offer the inmates the greatest amount of convenience and comfort.

The houses should be built on dry, well drained ground, and the material employed in their construction should be of such a nature that the possibility of insects harbouring in it is reduced to a minimum. All the wood used should be stripped of bark and be well dressed with a suitable insect-repellent fluid.

For best results the floors should be made of cement or a similar smooth impervious material. Sunlight in a poultry house is very important, and the structure must be so proportioned that, for part of the day at least, the sun can penetrate its whole depth. The best aspect for the house is north-east. All scratching and nesting material should be kept clean and be replenished whenever necessary. The water and food containers should be so designed and placed that the scratching litter and droppings of the birds cannot enter them. There should always be an ample supply of fresh water for the birds and it should be protected from the rays of the sun. It is important to clean the water containers thoroughly and regularly, as dirty containers and stale water provide excellent breeding places for harmful germs and bacteria.

All droppings in the runs and on the dropping-boards should be swept together at regular intervals and removed to the compost heap or straight to the lands for incorporation in the soil. Poultry manure is an excellent fertilizer, and besides, if it is disposed of in this manner, flies will not be given the opportunity to breed in it. The runs should be so planned as to permit of quick drainage of rain water, otherwise puddles are formed, and it is apparently inherent in the nature of fowls to drink from these cesspools whenever the opportunity occurs, in spite of the fact that they have easy access to a clean water source. Such puddles usually harbour disease organisms and the cystic form of internal parasites.

As ground occupied by poultry soon becomes polluted with these poultry ills, a system of rotation should be favoured, so that the birds can be kept on a clean piece of ground, while another is cultivated to a crop. When the chicken runs become vacant, they should also be put to some crop and remain unoccupied until the following chicken season.

The wise poultrymen will always plan to have his chickens and young stock on the highest-lying portion of the poultry plant. If this is not done, there is great danger of the chickens becoming

infested with internal parasites such as tapeworms, roundworms, coccidiosis, etc., due to these being washed and blown down into their runs in the droppings of the adult fowls.

Poultry should be given sufficient food, and the ration should always be well balanced, no matter for what purpose the birds are kept. The food should be of good quality and not contain mouldy or other harmful material. A liberal daily supply of finely cut fresh green-feed helps greatly to maintain the health of the flock. It is best to feed it in a hopper. As fowls live in close contact with each other, and eat and drink from the same containers, it is obvious that one diseased member can rapidly spread infection in the flock. A close watch should at all times be kept for any sign of disease, and at the first sign the affected bird must immediately be removed to a place of isolation for treatment. Such a hospital should be kept clean with disinfectants whenever the need demands. Care must be taken not to convey infection on utensils, hands, clothes and feet to the flock. In the event of a bird recovering from sickness, it would be wise (unless it was not pathological) to keep it isolated for a further period of two or three weeks, before it is returned to the flock. Perhaps the best policy would be to set aside a house and run exclusively for birds that recover from sickness, and to keep them there until they are slaughtered at a later date.

There is also the possibility of introducing disease through birds arriving back from shows, and birds purchased for breeding purposes. Such birds should be kept in isolation for at least two to three weeks before they are introduced into the flock. When it is necessary to bring strange birds into a flock, it is always safest to procure these from a breeder who has a healthy flock and holds a certificate to the effect that his birds have been tested for B.W.D. and fowl typhoid.

The cleaning and disinfection of the chicken and adult houses and their furnishings, whenever the need demands, should not be neglected. After every hatching season all incubators should be thoroughly cleaned and fumigated with a suitable preparation.

When the poultryman suspects the presence of a contagious disease in his flock, he should lose no time in isolating the sick birds and call in the assistance of the Division of Veterinary Services.

III. Why Hens Decline to Sleep on Perches.

Sometimes the poultryman is faced with the annoying fact that hens decline to sleep on the perches provided for them. Where a whole group of hens act in this way, they are usually pullets which have recently been transfered from the growing quarters to the laying house, and which have not previously been trained to use perches. In such an event there is no alternative but to lift the birds on to the perches every night, until they go there on their own accord.

To obviate this trouble, birds should be trained from chickenhood to perch by placing low perches about their quarters. When only some birds in a group decline to perch, there usually is some other factor responsible for their behaviour. There may be insufficient perching space for all the birds; the perches may be too narrow, too close together, too high or wrongly placed; or they may be infested with insects. Whatever the cause may be, it should immediately be remedied.

Perches serve best when they are arranged on the same level at about 2 feet above the floor. They should be of 2½ to 3 inch wide strips of wood with rounded edges, and be placed in rows not less than 1½ to 2 feet apart. Allowance should be made for each

bird to have 9 inches of perching space. It is best to lay 3 to 4 long, parellel perches in the deepest section of the house, and in line with the back wall, allowing a space of about 18 inches between the rearmost perch and the wall. Perches should never be situated in the front section of the house, where the birds are more exposed and liable to get wet from driving rain.

It sometimes happens that birds in a moult are bullied by the rest of the flocks, and consequently take refuge in the nesting boxes and corners of the house. They should be removed and put together in quarters where they have more comfort and undisturbed access to their food and water, which is very essential for a normal recovery.

IV. A Catching Crate for Handling Hens.

For whatever purpose pullets or hens have to be caught and handled, it is very important that the birds should not be chased or frightened, and that they should be disturbed as little as possible and be carefully handled. Chasing, frightening and rough handling of laying birds, particularly pullets, may cause a number of them to cease laying and, very likely, to go into a partial or even a complete moult, with consequent loss of eggs. There is also the danger of causing damage to the egg organs, e.g. rupture of the oviduct, breaking an egg in the oviduct, etc. In most cases such an injury is fatal. Where birds are kept on the semi-intensive or free-range system, a catching crate should be used. It is an appliance made of stout wooden strips, closed in with netting-wire. One end is provided with an up-and-down sliding door, and on top a door is placed for removal of the birds from the crate. The following dimensions may be used in the construction of the crate:—

Length, 6 ft.; width, 2½ ft.; and height, 2½ ft. The bottom must be solid. To trap the birds, the crate is so placed that the side with the sliding door is against the opening through which the birds must leave the house. The sliding door is lifted up and secured in that position, and the opening in the house is also opened. In most cases where the accommodation is the semi-intensive or free-range system, the birds will enter the catching crate readily. Should this not occur, they should be herded gently into it. When the crate has been filled, the sliding door is lowered, and the birds are caught and lifted through the top door. In this way the whole flock can be handled satisfactorily.

In most cases where birds are accommodated on the intensive system, difficulty will be experienced in enticing the occupants into the catching crate. In this case the employment inside the house of an 8-ft. length of 6-ft. netting-wire, with its long ends affixed to suitable lengths of light wooden poles, will be found very satisfactory. One pole end of the length of netting-wire is placed up against the wall about 3 ft. from one corner of the house, while the other pole end is held some 6 to 8 ft. from the wall. The birds are gently herded into the trap, and, when it is full, the open end is closed by placing it against the wall. The birds are then caught by an attendant inside the enclosure and handed out.

Development of the Sheep Industry in the Orange Free State.

Economic Factors Involved.

J. C. de Klerk, Sheep and Wool Officer, College of Agriculture, Glen.

THE exact date when the first stock farmers settled in the Trans Orange area cannot be determined with certainty, but it has been established beyond any doubt that as early as 1821, i.e. long before the Great Trek, farmers from the northern Cape Colony crossed the Orange river in search of grazing for their stock. Driven by drought and locusts, Cape farmers crossed the river again in 1828, the foremost pioneers settling with their stock along the Modder river(1).

Early in 1829 the civil commissioner of Graaff-Reinet was informed that the farmers north of the Orange river had begun to plough and sow and that some had penetrated as far as the Harts river(1). In July, 1829, field-cornet van der Walt gave notice of an agreement with the Bushmen to receive a piece of land along the Riet river, 49 miles long and 12 miles wide, in exchange for 3,000 head of small stock and 100 head of cattle. In 1830 a similar agreement was entered into between the Middleveld farmers and the Bushmen for another piece of land along the Riet river. Interviewed by the O.F.S. Commission of Enquiry in connection with the Free State-Basutoland border, J. J. Botes declared that, together with 14 or 15 families from the Beaufort area, he settled in the Smithfield area as early as 1830(1). It has been established beyond doubt, therefore, that by 1830 farmers had already settled north of the Orange river(1).

Originally this movement across the Orange river was of a very sporadic nature, but towards 1830 it developed into a seasonal migration. The farmers maintained that the shortage of grazing and water was not the only factor necessitating the moving of stock, but that in addition the animals always benefited by the change of pasturage and climate(1).

Although the first farmers in the Orange Free State possessed considerable numbers of large stock, they concentrated mainly on small-stock farming. The first large-scale importation of good merino sheep from the Cape took place in 1852 when a certain Page brought 600 ewes to the vicinity of Bloemfontein, and in 1855, when C. J. F. du Plooy imported 80 excellent rams from the Cape. Further importation soon followed and after that the sheep industry in the Orange Free State developed with increasing speed as will be shown hereunder(2).

According to Thom,(2) most farmers originally showed deplorable lack of enterprise. The methods learnt from their fathers as they grew up on the farm, were continued. They cannot be blamed for this, however, since at first they had no market for farm products, other than the Griquas and other Bantu tribes with whom they could barter, and the farm was expected to supply only the simple needs of the family. These needs, as regards clothes and other factory goods, were very few, since they manufactured practically all their own requirements and did not find it difficult to produce the necessary raw materials. Fortunately the farmers could live very cheaply

and since grazing was plentiful and could be changed as often as needed, the sheep remained in good condition and flocks rapidly increased by as much as 20 per cent. more than in the Cape([1]).

Fichardt([3]) also mentions the factors retarding the development of the sheep and wool industry, viz. the lack and exorbitant prices of fencing material and the habit of bringing the sheep to the kraal every night, owing to the presence of large numbers of beasts of prey.

Other factors responsible for the slow progress of sheep farming, were the practice of shearing on ground floors or in kraals and the method of packing, viz. baling good and poor fleeces together in the same pack. These practices were in no way discouraged by the buyers, who made no difference between good and poor quality wool([3]).

Nevertheless, the sheep industry in the Orange Free State made steady progress. After 1852 sheep were imported in large numbers from the Cape and in 1890 there were 6,619,992 sheep grazing on the Free State plains. Wool prices were, however, still very low. There was no market for wool in the Orange Free State and the clips had to be taken to the coast by wagon to be sold. In an attempt to improve conditions, the Volksraad decided in 1865 to establish a wool market in Bloemfontein([2]) but this effort was doomed to failure; at the first wool auction only 50 bales were offered, the wool being sold at 12d. to 13d. per lb. for scoured and 6¾d. for unwashed wool. The Basuto wars brought a sudden end to these wool sales([4]).

Despite the low wool prices (3d. per lb. in 1868 and 5d. per lb. in 1879) which remained low except during the boom years of 1873 and 1920-22, the sheep industry gradually expanded, reaching its climax in 1931 when the Orange Free State had 13 million merino sheep. This increase in the sheep population and the export value of Free State wool are clearly shown by the following figures:—

Sheep Population, All Breeds (cattle in brackets for purposes of comparison):— ([6] *and* [7]).

Year.	Number of Sheep. (all breeds)	Number of Cattle.	Ratio of Cattle to Sheep.
1856	1,167,693	—	—
1880	5,196,147	612,007	1 : 8·4
1890	6,619,992	895,009	1 : 7·4
1899	8,332,490	1,284,448	1 : 6·4
1904	2,999,547	363,204	1 : 8·2
1907	8,020,308	585,007	1 : 13·7
1911	8,587,638	1,286,234	1 : 6·6
1918	7,956,886	1,575,295	1 : 5·6
1921	9,046,599	1,732,005	1 : 5·2
1926	10,480,123	1,955,772	1 : 5·3
1928	12,038,401	1,935,419	1 : 6·2
1930	12,869,110	1,680,097	1 : 7·6

Export value ([2] and [5]):

1856, (£50,000); 1868, (£230,000); 1899, (£363,776); 1904, (£253,197); 1905/6, (£545,000); 1907, (£795,000); 1908, (£713,000); 1909, (£989,000).

Every area, whether it was mixed Karroo grassveld or mixed long grassveld or sourveld, carried its quota of sheep. The following table shows the numbers of sheep in the various districts for

the period ending 31 August, 1929, when the Orange Free State had 11,908,849 merino sheep and 296,521 non-woolled sheep(8):—

District.	Size in Morgen.	Number of Farms.	Sheep per District.	Sheep per Farm.	Sheep per Morgen.
Bethlehem	433,339	940	355,522	378	0·8
Bethulie	297,864	227	274,563	121	0·9
Bloemfontein	835,228	1,338	677,538	506	0·8
Boshof	1,180,872	1,135	630,007	555	0·5
Bothaville	520,128	652	233,678	358	0·4
Brandfort	508,636	573	460,294	803	0·9
Dewetsdorp	271,555	449	330,759	737	1·2
Edenburg	270,950	245	312,371	1,275	1·1
Fauresmith	1,038,139	669	688,276	1,029	0·6
Ficksburg	197,164	412	123,583	300	0·6
Fouriesburg	134,568	240	97,266	405	0·7
Frankfort	388,281	973	370,911	381	0·9
Harrismith	893,592	1,019	687,687	674	0·7
Heilbron	558,230	1,049	483,969	461	0·8
Hoopstad	908,409	904	444,876	492	0·4
Jacobsdal	368,625	264	188,323	713	0·5
Kroonstad	679,492	977	594,554	608	0·8
Ladybrand	337,176	720	286,572	398	0·8
Lindley	332,942	619	318,939	515	0·9
Philippolis	385,560	222	276,943	1,247	0·7
Reitz	316,008	644	287,672	446	0·9
Rouxville	318,427	382	374,884	981	1·1
Senekal	502,891	869	461,447	531	0·9
Smithfield	353,203	348	401,480	1,153	1·1
Thabanchu	358,344	477	384,791	806	1·0
Trompsburg	224,380	163	210,818	1,293	0·9
Vrede	658,022	896	681,481	760	1·0
Vredefort	395,539	906	254,154	280	0·6
Wepener	198,676	192	236,219	1,230	1·2
Winburg	924,436	1,351	776,878	575	0·8
Zastron	222,566	419	297,797	710	1·3

The rise in the general standard of living and the development of the mining industry and other urban industries, made higher demands on farmers. They are expected to feed the cities and to buy the commodities from the city in increasing quantities. Farms now not only have to produce food for home consumption but must also bear mortgages; the farmer must have tractors, motor cars, etc., in order to keep pace with modern farming practices and maintain his social standard of living.

Many of the shortcomings of the present farming system can be ascribed directly or indirectly to the economic difficulties with which the farmer of to-day has to contend. The whole problem of deterioration of the soil is closely bound up with economic factors. The farmer is directly responsible for the abuse of our agricultural resources, but it would be extremely unfair to put all the blame on him. He has been caught in the whirlpool of an economic system, not created by him, which, to a large extent, compels him to exploit his agricultural resources in order to meet the demands placed upon him and maintain a reasonable standard of living. This economic system is largely of national, or to be more exact, international origin and the population as a whole should be held responsible for the practices resulting from such a system(9).

Uncontrollable Economic Factors.

The following are some of the economic factors over which the sheep farmer has no or very little control and which contributed

towards the general deterioration of merino-sheep farming in the Orange Free State:—

(1) *Droughts.*—South Africa is known for its precarious climatic conditions and its recurring periods of grazing scarcity and water shortage. Most stock farmers therefore have the tendency to make up the leeway in years of prosperity by keeping more stock than the vegetation can carry, with the result that overstocking and trampling of the veld takes place. These periodic droughts are not a modern phenomenon; according to Theal, they also occurred in the 15th, 16th and 17th centuries. For the stock-farmer, therefore, they remain a problem of the greatest importance.

(2) *Stock Diseases.*—South Africa is not only ravaged by drought but also troubled with a large variety of stock diseases and parasites. Bluetongue and geilsiekte have occurred from the earliest times; in 1855 geilsiekte was so severe that the State suffered total losses estimated at 5 to 10 per cent. and in 1857 stock losses resulting from geilsiekte, wetness and cold in the O.F.S. amounted to 33 per cent.([4]).

Two parasites should be mentioned which in the recent past have become an important economic factor and have contributed towards making the position of the merino sheep farmer desperate, forcing him at times to turn to other branches of farming.

One of these is the *sheep blowfly*. Before 1920 the blowfly problem was practically unknown, but since then this problem has become a serious economic factor ([10]). Direct and indirect annual losses run to vast sums and farmers who formerly went in for merinos on a large scale have now switched over to non-woolled sheep in order to evade this serious menace.

The other is internal parasites, especially the *nodular worm*. This parasite was found in stock for the first time in Natal during the years 1921-23.

During the severe drought of 1930-33 many Free State farmers moved with their sheep to Natal, and brought this parasite back with them. To-day it has spread over the whole of the Orange Free State. The direct annual losses through deaths caused by these parasites alone are very heavy. Indirect losses can be seen in the small, stunted sheep with very low resistance, small carcases and light and undernourished fleeces. In addition, these parasites affect the fertility of ewes and lead to poor lamb crops.

The following is an extract from the report on the "Investigation of the Deterioration of Sheep farming in the south-eastern Orange Free State", 1941. As soon as sheep show signs of stunted growth, they are dosed once or twice with wireworm remedy, K.W.M., Tetram, Gow's or tobacco and blue vitriol. If their condition does not improve, the remedy is regarded as ineffective and something else tried. Remedies such as Nodulex, Vermisol, Cooper's Dip, Intestol, Coal tar, Ebedes, etc., are in general use. Except in a few cases, the practice of dosing regularly every three weeks with a recognised worm remedy is non-existent. Wherever sheep were in poor condition, post mortem examinations showed worm infestation, especially nodular worm. Irregular dosing with Cooper's, Gow's and Hairworm Remedy, etc., seems to have brought hairworm under control to a considerable extent.

(3) *Jackals.*—Jackals play an important part in sheep farming. In this connection it is only necessary to refer to the fact that Karroo farmers had to spend vast sums in order to have their farms enclosed with jackal-proof fencing.

The Orange Free State is still infested with jackals and a glance at the report of the Drought Investigation Commission of 1923 will give readers an idea of the evils to which the jackal pest may give rise. Only a few farms in the southern Orange Free State have been fenced in with wire netting; the rest of the Province has no vermin-proof fencing. In order to show how serious the jackal menace still is, it may be mentioned that, according to data collected by the K.W.B. and B.S.B. of Durban (on the initiative of the Transvaal branch of the N.W.G.A.), a total of 46,748 animals were killed by jackals in the O.F.S. during the five years 1941-1945(12).

Naturally indirect losses are incalculable.

(4) *Fluctuating prices of mutton and wool.*—In the past the fluctuating prices of agricultural products were characteristic of farming in South Africa and very discouraging from the producer's

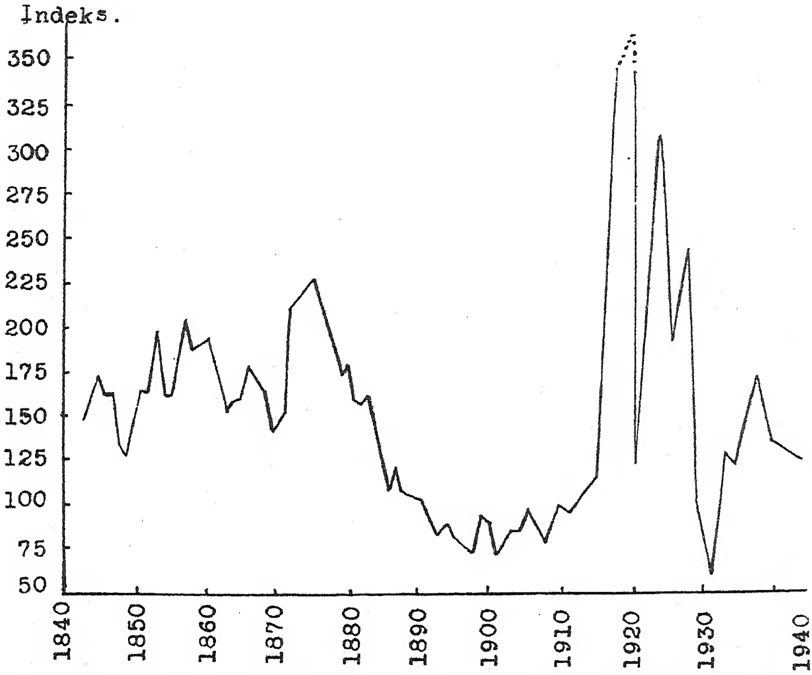


FIG. 1.—Index figures for export prices of wool shipped from Port Elizabeth, 1843 to 1939 (1910—14=100).

point of view. The farmer must bear all the risks attending production, but when his wool is marketed the price depends on the whims of the goddess of chance (see Fig. 1)(14).

A few more historical facts may not be out of place here. In 1860 a general decline in the price of wool set in, and in 1862 the "Friend", discussing this fact in its leaders, ascribed it to the poor methods of packing.

Prices showed a further fall during the period 1865-70 as a result of the agricultural depression in South Africa and the depression in England following the American Civil war. In 1868 the price of wool fell by 3d. per lb. and on this basis the value of greasy wool in the O.F.S. was no higher than 3d. per lb. In 1870 the average price for greasy wool was 5d. to 6d. per lb. and for scoured wool 9d. to 12d. per lb. Owing to the high transport costs to the coast, woolwashing on a considerable scale was undertaken in the Orange Free State, notably at Harrismith, Reddersburg, Bloemfontein, etc.(4).

After 1870, the discovery of the diamond fields caused a sudden rise in wool prices which reached its climax in 1875, after which a general depression set in, causing wool prices to fall lower than during any year before the period 1854-80. Only in 1878 could it be reported that prices were slightly more settled, and in 1879 wool was sold in Bloemfontein at 5d. per lb. for greasy wool, 5¼d. to 5½d. for medium super wool, and 7½d. to 9d. per lb. for scoured wool. In 1880 pricees rose, greasy wool being sold at 6¾d. to 7d. and scoured wool at 13d. to 19¾d. After that, wool prices fell gradually with short-term fluctuations until the Anglo-Boer war broke out in 1899[4].

The only period of stable wool prices ever experienced by Free State wool farmers occurred during the past world war, when an agreement was made between the Union of South Africa and Great Britain under which the latter bought the entire wool clip of the Union at an average basic price of 10·75d. per lb., as from Sept., 1940. In Sept., 1942, this basic price was raised by 15 per cent. to 12·36d. per lb. but was again reduced by 5 per cent. to 11·7d. in Sept., 1945. For the 1944-45 season Free State wool prices rose as high as 22d. per lb. the averages for some clips ranging from 11·7d. to 16·4d. per lb.

This wool-purchasing scheme was carried out by the British Wool-Purchasing Commission whose activities ceased on 30 June, 1946.

After the termination of this scheme, however, the Free State wool farmer was not again subjected to the vagaries of the old open-market system. In order to ensure future stability for the wool farmer through orderly marketing and the guarentee of a minimum price, the South African Wool Marketing Organization was established to co-operate with similar organizations in the Commonwealth and Great Britain. The basic price for the 1946/47 season was fixed at 14·15d. per lb. The minimum basic price is fixed in advance for one whole season and can only be altered from the beginning of the next season in consultation with other wool-marketing organizations.

This system of wool marketing is unique in the history of the marketing of products in that a minimum price is guaranteed to the producer in an open-market system without any maximum-price limitations. If the wool fails to realize the minimum basic price at which it was evaluated by the appraisers of the wool-marketing organization, this organization buys it at that price in the open market.

In order to administrate and finance this scheme, however, the wool farmer must pay a levy of 7½ per cent. on his gross wool returns. This levy may vary from year to year.

Mutton is in a very similar position.

Not only were there annual fluctuations, but also sharp seasonal fluctuations in spring and autumn prices. These annual fluctuations can be seen very clearly from Fig. 2.

As in the case of wool, the stock farmer had in the past always been at the mercy of the goddess of fortune as regards the price of mutton. In 1854 a Graaff-Reinet farmer bought ewes at 10s. to 15s. along the Caledon river, and this was regarded as a good price.

Even in those times the price of stock varied from time to time. but apparently the average prices of sheep were 10s. before 1860, about 7s. 6d. in 1865 and from 5s. to 7s. 6d. between 1875-80.

After the 2nd and 3rd Basuto wars and the discovery of the diamond fields, stock prices began to improve and in 1870 at a sale in Smithfield, Afrikander sheep were sold at 8s. apiece and merinos at 10s. apiece, and in 1873 at an estate sale in Kroostad, dry ewes were sold at 15s. 6d. apiece[4].

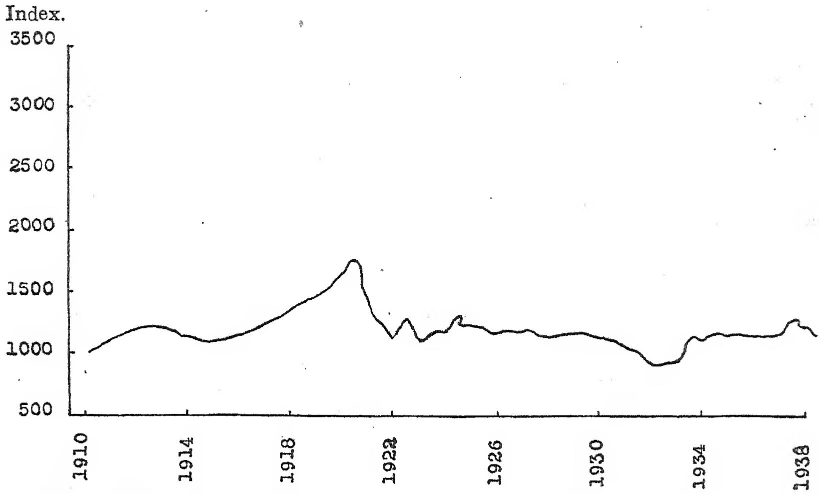


FIG. 2.—Retail prices of meat—1910 to December 1938—most important towns and cities.

(5) *Uneconomic holdings.*—The day of large farms was, however, passing. The system of hereditary tenure under which the land was subdivided among the owner's children aggravated the position and farms became smaller and smaller.

In order to give the reader some idea of the extent to which farms have been subdivided, the sizes of farms in the Rouxville* district are given below. The figures were elaborated by the writer from data obtained at the Deeds Office, Bloemfontein (1941).

Size of Farm.	Number of Farms.	Percentage.	Size of Farm.	Number of Farms.	Percentage
Under 50 morgen	68	10	601–400 morgen.	41	6
50–100 „	68	10	701–800 „	37	5·5
101–200 „	75	11	801–900 „	36	5.3
201–300 „	85	12·5	901–1,000 „	17	2·5
301–400 „	71	10·5	1,001–1,500 „	48	7
401–500 „	43	6	1,501–2,000 „	20	3
501–600 „	57	8.5	Over 2,000 „	6	1
TOTAL.......	—	—	—	672	100

The following are interesting examples of farms in the Wesselsbron district which, once large, had by 1943 been subdivided as follows:—

Farm A.—In 1930 the farm extended over 6,000 morgen and carried almost 6,000 sheep. At present it is occupied by eleven owners, who all go in mainly for crop production. To-day these properties carry only 2,500 sheep and have an annual maize production of almost 20,000 bags.

Farm B.—In 1935 the farm extended over 2,500 morgen. It has now been divided into 12 sections, occupied by ten owners.

Farm C.—Comprising 3,400 morgen in 1934, this farm has now been divided into 10 sections, occupied by eight owners.

Farm D.—Comprising 1,440 morgen in 1939, this farm now consists of four sections occupied by four owners.

* The Rouxville district lies on the line dividing the grassveld from the Karroo, and 60 per cent. of the farms are less than 500 morgen in extent.

Farm E.—This farm always carried 1,500 sheep; divided into 4 sections, it now carries not more than 600 sheep.

In other words, these five farms, occupied by five owners until 1930, are now occupied by 37 owners. The change in the system of soil utilization was a further contributing factor, especially in crop-raising areas where the large stock-farms of the past have been subdivided and put to the plough. The area under natural grazing has been whittled down and sheep have been pushed into the background.

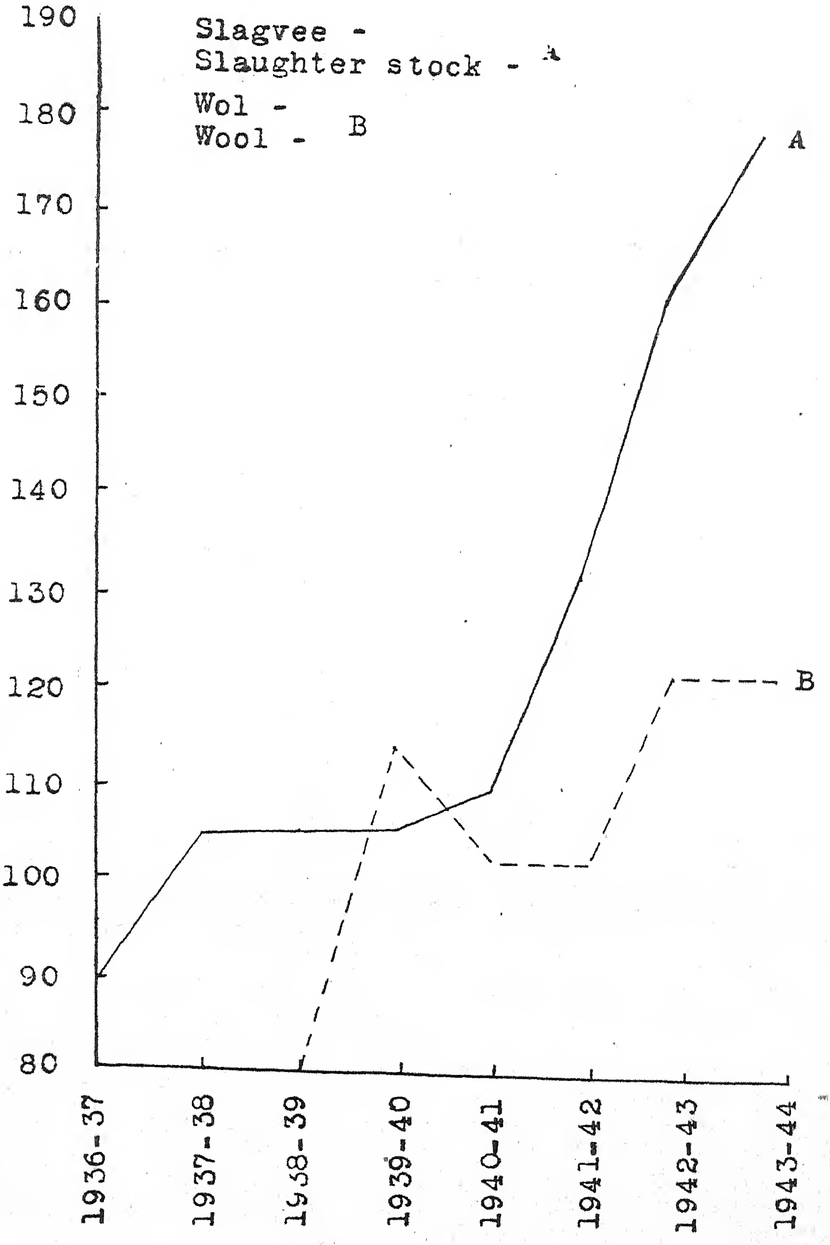


FIG. 3.—Index figures for meat and wool products, 1936—37 to 1943—44 (1936—37 to 1938—39=100).

This change in the farming system is a wholly natural occurrence, but it contributed largely towards the decline in the numbers of sheep kept on the farms.

(6) *Soil Depletion and Erosion.*—The deterioration of the natural grazing is one of the main causes of the decline of merino-sheep farming in the Orange Free State. This deterioration was caused by overstocking and trampling, and aggravated by the systematic annual burning of the veld, which has continued for more than a century, first by the Bantu tribes and later by the Europeans. The system of veld utilization applied in the past has brought about considerable changes in the natural vegetation. Not only have the original valuable grasses been ousted by stick grass over large areas, making it impossible to keep merino sheep there, but large portions of the southern Orange Free State were overrun by worthless shrubs such as "bitterbos" etc. The old system of continually moving stock to new, healthy grazing had to be discontinued, and to-day sheep are expected to thrive year in and year out on a small shrinking piece of land. Following on overstocking, trampling and veld-burning, soil erosion set in, aggravating the position still further. It became more and more uneconomical to keep merino sheep on such deteriorated veld, and the position of the industry is steadily growing worse.

(7) *War Influences on Sheep-Farming.*—There are three aspects of the influences of the last war which are of special interest for our purpose.

First, the outbreak of the war in 1939 gave rise to a tremendous increase in the demand for meat as will be seen from the following figures of the number of sheep slaughtered at municipal abattoirs in the Union[16].

1939	3,511,000
1940	3,870,000
1941	4,432,000
1942	4,804,000

From this it is clear that, over the period of four years 1939-42, there was an increase of 37 per cent. in the number of sheep slaughtered. The number of sheep slaughtered in the Orange Free State alone, is of course, unknown. If only surplus or non-producing sheep had been sent to the abattoirs, it would not have made much difference.

In the case of cattle it is known that the slaughtering of cows and heifers was increased by 68 per cent. If breeding sheep were, therefore, slaughtered to the same extent as cattle, our merino stock will show a further downward tendency in the near future.

Secondly, prices boomed as a result of the great demand for meat and undoubtedly would have risen even higher if it had not been for the control measures instituted by the Government. It is important, however, that according to fig. 3, wool prices did not rise as high as mutton prices[15]. These favourable meat prices led many farmers to turn to crossbreeding for meat production, and in this way detrimentally affected the wool industry.

Since these favourable meat prices are at present being stabilized by the State, it may be expected that they will have an equally strong influence on tendencies in stock-farming.

Thirdly, land prices also rocketed, as is always the case during a war when there is a heavy demand for all agricultural products. An analysis of the rise in land prices in the O.F.S. is given in Fig. 4.

Fortunately for the farmer, this increase in land prices was checked by the control measures instituted by the Government. Whether the rise in the prices of animal products will compensate for the higher prices of land, is an open question. The fact remains, however, that the prices of agricultural products will have to fall again at some stage, whereas the mortgage on the farmer's property will remain the same([17]).

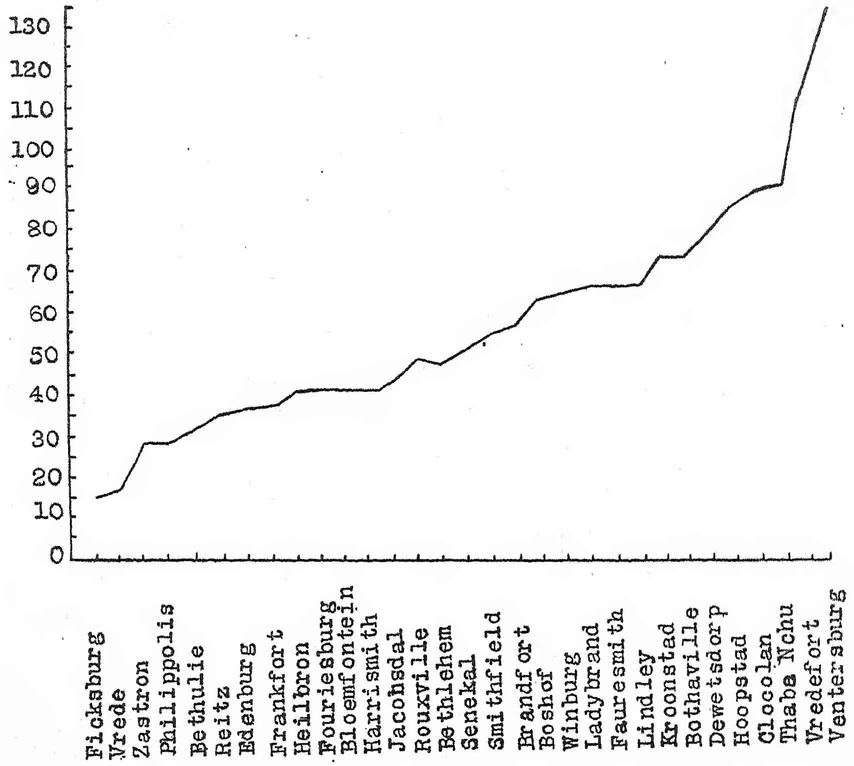


FIG. 4.—Rise in land values, on percentage basis, during 1940—45 of certain groups of farms in the O.F.S., with 1936—39 as basis=100.

Another factor which should also be borne in mind is the rich gold strike in the Orange Free State. The extent of its contribution towards the present inflation of land prices is, of course, difficult to determine.

Weaknesses in Sheep-farming, and their Causes.

Although we may be justifiably proud of the present standard of our sheep farming, we have no reason for self-satisfaction. Certain latent weaknesses are now gradually becoming evident. As the farming system became more and more intensive, a slow but cumulative depletion of our soil, vegetation and water sources took place, exhausting our natural wealth on which not only successful farming but also the future of our nation, depends. Overstocking and injudicious veld management caused general deterioration of the natural vegetation. In addition farming was often developed in the wrong direction. Sheep-farming, e.g., was unfortunately introduced in the long-grass areas, where internal parasites caused high mortality and the carrying capacity of the veld was diminished, since sheep inevitably graze the grass down to the ground.

The most serious error committed in the development of stock-farming was failure to stabilize the production factors, viz. the soil, water and vegetation. Since this is still a young country, however, the farmer or agriculturist cannot be reproached for not immediately establishing stable farming systems. Extensive observation was necessary before specific farming systems, properly adapted to the different regions in our country, could be recommended, and even to-day considerable investigation is still required.

Soil depletion and erosion are not, however, due only to ignorance and the application of wrong farming systems. There are other causes of which the most important is the economic pressure which forced many farmers into overcropping and overgrazing, especially after the price collapse of 1929. The repeated and violent price fluctuations experienced during the past quarter of a century also gave rise to a tendency among farmers to turn from inherently sound farming systems. Futhermore, exploitation of the soil becomes practically inevitable when farms are subdivided into small sections which cannot offer their owners an assured living.

Foundations of Agricultural Policy.

From the foregoing it should be clear that the farmer cannot work out his own salvation for the future, without State intervention.

To-day this fact is duly realized by the Government, which recently explained its policy in a White paper on Agricultural Policy([18]). Its main aims are the following:—

(1) To contribute towards making "conservation farming" a general practice and in this way protecting and building up our soil, water sources and useful plant life; and

(2) to make farming more productive by raising the educational level of the farmer, encouraging the adoption of more modern farming methods, promoting price stability, stabilizing the market, ensuring better transport facilities, etc.

Economic Stability of Farming.

When the struggle for existence becomes too hard, man sometimes resorts to measures which he would not have applied otherwise. In their despondency, farmers turn to overcropping and abuse of the gifts of Nature. If conservation farming is to supersede overcropping, action will have to be taken not only in the biological and physical sense, but also in the sphere of economics.

During the period between the wars, farming all over the world received a catastrophic setback when the purchasing power of agricultural products fell in comparison with the prices of urban commodities, especially with the total price collapse of the years 1930-33. The turning point came during the last war, however, when rising costs and a world shortage of food led to high prices for food and agricultural products. Now, however, a sound balance must be restored.

In order to achieve the necessary price stability, the Union Government will make use of the control-board system introduced under the Marketing Act of 1937. The basic aim of the system is regulated marketing. Improved grading and cheaper distribution are important additional aims which have already largely been achieved in the case of meat. In consultation with the British Government, wool prices were also stabilized during the war years and in future the position will be maintained and improved by the Joint Wool-Marketing Organization which was established by the governments of the British Commonwealth in accordance with the wool-marketing plan.

Conservation Farming.

Conservation farming is a matter of faith as much as a method of farming. The key to conservation farming is to be found in the application of systems adopted to particular natural conditions with a view to eliminating the principal causes of erosion, viz. denudation and exhaustion of the soil, and loss of water. In the system applied, special emphasis should be placed on soil improvement and the keeping of better animals. This is the only way in which farming can be stabilized in the Orange Free State with its highly erodible soils.

Control of the natural veld for the protection of the vegetal cover, proper care of stock and, ultimately, erosion control, is just as important as building contour and diversion banks. The former involves the control of grazing and veld-burning, the construction of watering places, the building up of fodder supplies, the planting of fodder trees and the utilization of irrigable soil for the production of fodder reserves instead of marketable products.

The responsibility for conserving our agricultural resources rests on our farmers and will continue to do so in future. In order to make their efforts more effective, however, the Government will aid them, not only financially and through the construction of certain erosion works, but also by providing adequate professional staff for field work. With this end in view, a strong soil conservation and extension service has already been established.

The Government has already proved that it intends to suit the action to the word by passing the meat and wool marketing Acts, aimed at securing regulated marketing and stable prices for the producer. This fact is of the utmost importance to the sheep and wool industry in the Orange Free State.

The stabilizing influence of these Acts will enable the industry to adopt a definite policy, since the farmer now knows exactly what is at stake.

The Soil and Veld Conservation Act.

This piece of legislation is a very important milestone in agriculture and will prove to be of inestimable advantage to our livestock industry. Its aims, among others, are the following:—

(*a*) The withdrawal of animals from certain pastures for specified periods;

(*b*) limiting the numbers and types of livestock to be kept in any area;

(*c*) the control of veld-burning and the extinguishing of veld fires; and

(*d*) in general, the prevention of soil erosion, the protection, conservation and improvement of the natural grazing, the soil, the surface of the land, the vegetation and the water sources of the country as a whole.

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 [*Continued on page 468.*

Improvement of Papaws.

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SELECTION plays a very important part in the improvement of all agricultural crops, especially in cross-pollinated crops such as the pawpaw. Since the pawpaw is cross-pollinated, it is difficult to maintain the desired selected qualities. This applies to all desirable selected pawpaw types, especially the golden oval-shaped type, "Hortus Gold" which is of commercial importance and should therefore be kept true.

Since seed cannot always be obtained from a reliable source, there is always the danger that unless timely precautionary measures are taken, cross-pollination will take place with undesirable types, in consequence of which the desirable qualities of the specially cultivated types would soon be lost, especially since pollen can be transported over long distances.

Where, particularly in the case of certain specially in-bred varieties, seed shows poor viability and where, in addition, it is eventually necessary to remove the great majority of the male plants, a considerable quantity of seed is required. It is therefore, imperative that seed of the desired types should as far as possible be selected by the farmers themselves for their own use. In order to do this successfully, however, and to eliminate all danger of hybridization with other undesirable types, the required precautionary measures against hybridization must be very carefully applied. In order to help growers in this respect the technique of controlled pollination is therefore briefly described.

Technique of Controlled Pollination.

When the seeds have been sown and the plants derived from them have yielded their first crop, the grower will find that differences occur. From these plants the grower now selects one or more of the best female plants to serve as mother trees. When selecting these plants, he should bear the following desirable characteristics in mind: vigour of trees, size and shape of fruit, colour of ripe fruit, which should be golden in this case, thickness of flesh, quality of fruit, yield and spacing of fruit on the stem, which should be such as to ensure no malformation in the fruit through overcrowding.

In order to retain the good qualities selected by the grower and to propagate the type as true to type as possible, the flowers of the mother trees selected must be pollinated with pollen from male trees of the same origin. This is easily accomplished if a brown paper bag is fastened around the female flower before it opens. The bag is kept in position by attaching it to the stem with a paper fastener.

Flowers of the selected male plants which are on the point of opening, are taken to the mother tree and the petals are removed to expose the pollen. The paper bags are now carefully removed from the female flowers and their stigmas brought into contact with the pollen of the male flowers. This is done by simply drawing the

male flower over the stigma of the female flower. After pollination, the paper bags are replaced over the female flowers and removed after a fortnight. The mother trees pollinated must be marked so that the grower will know which trees were pollinated and keep their fruit for seed.

Another method of controlling pollination is isolation. In this case the selected type is planted in an isolated spot where there is very little danger of cross-pollination. Pawpaw pollen can be transported over long distances and where this method is followed, therefore, the various types should be planted at least half a mile apart and half a mile from other pawpaws. Although this method is simpler, it is not as reliable as the first method.

When the fruit is ripe, it is picked and the seed removed, washed, dried and stored until the following sowing season.

Yema Graft of the Vine :—

[*Continued from page* 436.

time on the subject. It is convenient and his vineyard is soon uniformly established. There is, therefore, no particular need for any other method of propagation.

(2) If the farmer finds it more convenient to plant his wild vines and topwork them in the soil at a later stage, it will take longer to bud than to graft.

(3) Budding should be carried out about February—a period of the year when the farmer generally has many other duties to attend to.

Advantages of Budding.

(1) A practically perfect union is obtained. Consequently the flow of sap is hardly disturbed and the vine can perform its maximum functions and attain a good age.

(2) In comparison with grafting in the soil, the chances of a uniform vineyard are twice as good. If the budding during February was unsuccessful, the vines can be grafted in the soil in the usual manner and at the usual time, during the following spring, since they remain undamaged.

(3) Budded vines grow better during the first full growing season than those which have been grafted in the soil. They begin to grow early and develop very rapidly since the buds became established during the previous summer.

Vines which have been grafted in the soil, on the other hand, grow slowly and often become established only late during the year.

(4) It is not necessary to store budwood for long periods.

(5) White grubs are less troublesome, since the bud is opened up before the shoot develops.

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The Mango in South Africa.

I. Soil and Climatic Requirements, and Varieties.*

Dr. Raimund H. Marloth, Officer-in-Charge, Sub-tropical Horticultural Research Station, Nelspruit, Eastern Transvaal.

WITH such a variety of deciduous and citrus fruits being produced in the Union it is not surprising that the commercial production of other sub-tropical and tropical fruits is limited to only a few types. Of these the mango may be considered one of the most important, surpassing the avocado, banana, grenadilla, guava and litchi in acreage, capital investment, and value of crop produced.

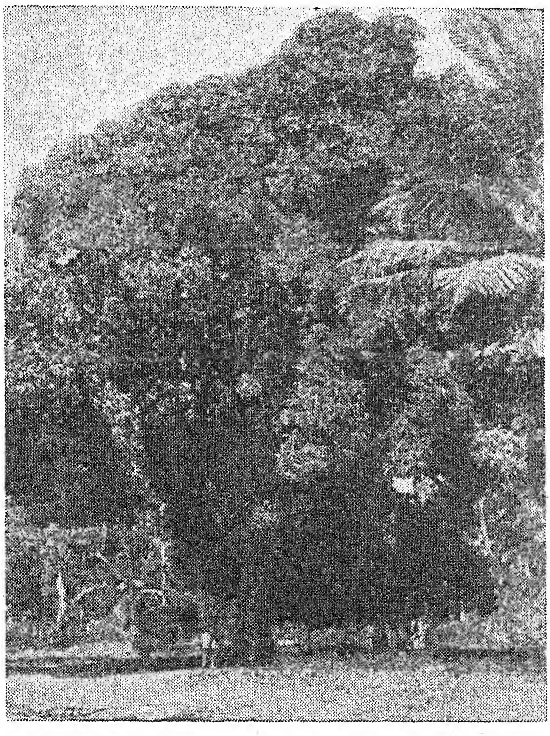

Fig. 1.—Seedling mango tree several hundred years old, growing at a former slave-dealer's village in Kenya.

The mango is a native of eastern India and has several species and near relatives, but the cultivated type is restricted to one species, *Mangifera indica*. This, through the centuries, has spread to all tropical and sub-tropical countries in the world, and to-day this "King of Fruits" has assumed commercial importance in most of these countries. It is not known when the first mangoes were introduced into the Union, but Ducasse records an orchard in Durban planted about 1860. It is safe to assume that seedling trees,

* Parts II and III of this article will appear in later issues. Part II will deal with propagation and cultural practices.

originating from Mauritius, the East Coast, the Malay Archipelago or India, must have been growing in Natal many years before that date.

Soil and Climatic Requirements:

Since the mango is frost-susceptible, young trees and new growth being killed at a maintained temperature of two degrees below freezing point, the cultural area of the mango is limited by low temperatures. However, while magnificent tree growth is obtained under tropical conditions with an abundant rainfall spread over the whole year, very few varieties will crop well under such conditions. Ideal climatic requirements for combined growth and fruiting appear to be a cool winter and a hot summer, with relatively small night and day changes in temperature during both seasons and an annual rainfall of 30-40 inches, *provided* that from the start of blossoming-time till the fruit has started sizing up very little rain falls and the air is hot and dry. Rain or dew during the fruit-ripening period will result in considerable loss of fruit through disease. Soil type is hardly a limiting factor in modern commercial mango production, although it is essential that good drainage should exist, but, since the mango tree prefers a deep loam to sandy loam soil, better results can be expected from orchards on these types than from those on very sandy or heavy clay types.

Mango-Growing in the Union.

The principal mango-growing areas in the Union to-day are (1) the eastern Transvaal (Schagen-Hectorspruit zone), (2) north-eastern Transvaal (Tzaneen-Ofcolaco zone), and (3) Natal (coastal zone), with scattered plantings in the western Transvaal, eastern Cape Province, and western Cape Province. While our total plantings are small in comparison with those in some other mango-growing countries [India alone having over 1,100,000 *acres* of mangoes according to Sen (1944)], the past few years have seen an appreciable increase in the number of trees planted, while the number of trays of fruit sent to the eight principal markets in the Union has increased from a yearly seasonal average of about 250,000 before 1939 to 1,011,000 in the 1944-45 season. Until the figures for the 1946 Agricultural Census become available (the last Census including mangoes having been held in 1937) it is possible to make only a rough estimate of the extent to which the mango industry has

*Mango trees (farms and small holdings only) in South Africa.**

Year.	Variety.	Cape.	Natal.	Transvaal.	Orange Free State.	Total.
1930	Bearing..............	90	41,860	139,060	Nil.	181,010
	Non-Bearing.........	260	5,590	43,980	Nil.	49,830
	TOTAL..........	350	47,450	183,040	Nil.	230,840
1936	TOTAL..........	1,333	45,583	187,619	Nil.	232,535
1937	Bearing..............	344	40,139	184,031	Nil.	224,514
	Non-bearing..........	435	3,930	37,718	Nil.	42,083
	TOTAL..........	779	44,069	221,749	Nil.	266,597

* Data kindly supplied by the Office of Census and Statistics, and obtained from the respective Agricultural Censuses of the Union.

developed. New plantings and older trees increasing their production have resulted in an estimated quadrupling of the total production during the past ten years. From personal observation and from figures supplied by nurserymen it is thought that a tremendous increase in the 1937 total of 266,597 trees in the Union has taken place, and the major portion of this increase is not expected to be in full production till 1950 or later. Most of the new plantings have been made in the eastern and north-eastern Transvaal lowveld.

The mango tree is an evergreen, growing to an immense size under favourable conditions and known to reach several hundred years in age.

Tree growth proceeds from terminal shoots by several irregular flushes during the course of the year, and it is the timing of these flushes and their intensity which greatly determines the size of the crop ultimately borne, for although the tree usually flowers every year, the mango has a distinct tendency towards bearing in alternate years. Varieties also differ very greatly in their productiveness in different areas. In an extensive study of this behaviour, Lal Singh and his associates (1944) in the Punjab found that fruiting and vegetative growth was always at the expense of each other during the growing season, with a direct relationship between the number of shoots growing in one season and the number of flowering shoots the following spring. Fruit-bud initiation occurs only on one-season-old shoots, and the highest yield was from flushes initiated early in the previous season. An external factor such as frost, drought, excessive rain, etc., which upsets the equilibrium of the tree, will greatly accentuate the alternate bearing. In the Union normal flowering is from May to August, with the fruit ripening from November to February. Two types of flowers, staminate or males out-numbering the bisexual perfect ones with greenish-yellow ovary and single pollen-bearing stamen, are borne in clusters on branchlets forming terminal panicles which vary in colour, compactness and size, depending on variety.

Pollination and Fruit-Setting.

Through the courtesy of the Imperial Bureau of Fruit Production a questionnaire on fruit-setting of the mango was sent to over forty institutions in countries throughout the world in which the mango is grown, and this opportunity is taken of thanking the numerous workers who responded.

Wide divergence of opinon exists as to the agency responsible for the pollination of mango flowers. To those who claim that the mango is wind-pollinated it is pointed out that Nature has constructed the flower in such a manner as to provide for pollination by insects. The few pollen grains produced are large and show a tendency to cling together even in dry weather, the stigma is small and not provided with projections to catch wind-borne pollen, and the nectar produced serves to attract insects. The flowers are visited by flies, wasps, bees, butterflies, moths, beetles and bugs, these insects ranking more or less in the above order as to the number of visits. It seems that, in spite of the numerous insects visiting the flowers, only a very small number of stigmas have pollen brought to them from other flowers. With some varieties self-pollination to a limited degree has been indicated.

Fruit-setting is not dependent on pollination, but no fruit will reach normal size and maturity without pollination. There is no record of any truly seedless mango variety. Varieties differ greatly as regards degree of fruit-setting, whether it be of fruit lacking a

fertilized embryo and dropping before any appreciable development occurs, or of fruit which matures as small poorly flavoured fruit containing a seed coat without a developed embryo or seed, or of fruit which develops normally. The Peach and Sabre in South Africa, the Haden in Florida, the Maha-mudaliyar in Ceylon, and a number of varieties in India and in British Guiana are all reported to exhibit the 'small fruit' phenomenon which causes such concern to mango growers in the eastern Transvaal. It is here submitted that this phenomenon is a varietal physiological response to climatic conditions prevailing at the time of fruit-setting. Extensive observations on over fifty varieties growing in one orchard showed that some varieties set heavy crops of fruit all having a fertilized embryo, others set heavy crops with only a few fertilized embryos, while others like the Peach and Sabre are intermediate. However, it was noted in Kenya that Sabre trees imported from the Union bore excellent crops of normal fruit, 'small fruit' being absent.

In the Union, over a period of several years, the amount of 'small fruit' which remains on trees of the Sabre variety is negligible; counts made in the 1946-47 season in one orchard which bore 650 normal fruits per tree gave only 2½ per cent. of the total crop as 'small fruit'. However, in the same year adjacent Peach trees of the same age averaged only 65 normal fruits with 1,600 'small fruit' per tree, all of which remained hanging till the normal fruits were mature.

In general the climatic factors interfering with pollination are rain, mists, cool weather, and also hot dry winds. Sunny warm dry days with little wind during the blossoming season are favourable for pollination. but in South Africa, despite considerable research throughout the world on the problem, the failure of several varieties to bear normally and regularly remains a practical problem.

Varieties.

As is to be expected with a type of fruit which for centuries has been propagated by means of seedlings, many hundreds, even thousands, of mango varieties exist to-day, although horticulturally speaking a fruit is not given the distinction of being a separate variety until such time as it has been perpetuated by means of vegetative propagation and has been described. Wester (1922) describes some 300 varieties of Indian mangoes alone, while other mango-growing countries such as the Philippines, the Malay Straits, Java, Brazil, Hawaii, the United States, and even the Union can contribute at least an equal total number not included in his list. Popenoe (1941) places all mangoes in races and groups, and, because of the similarity between many so-called varieties and the confusion existing to-day in the world nomenclature of the great majority of varieties, definite varietal names should only be used for vegetatively propagated trees offered for sale when no doubt exists as to identification.

At the Sub-tropical Horticultural Research Station, Nelspruit, recent importations from Brazil, Ceylon, India, and the United States, plus local selections, have brought the number of varieties for planting in the Mango Variety Orchard to 68. Apart from this planting, very few grafted or budded trees of the selected better varieties grown elsewhere in the world are to be found in the Union.

It is intended to distribute from Nelspruit to other mango-growing areas vegetatively propagated trees of those varieties which after trial show promise, in order to ensure that in years to come, through propagation of such trees by commercial nurserymen and subsequent sale, an improvement in the quality of fruit produced, quantity borne per tree, and an extended marketing season for the mango industry is brought about.

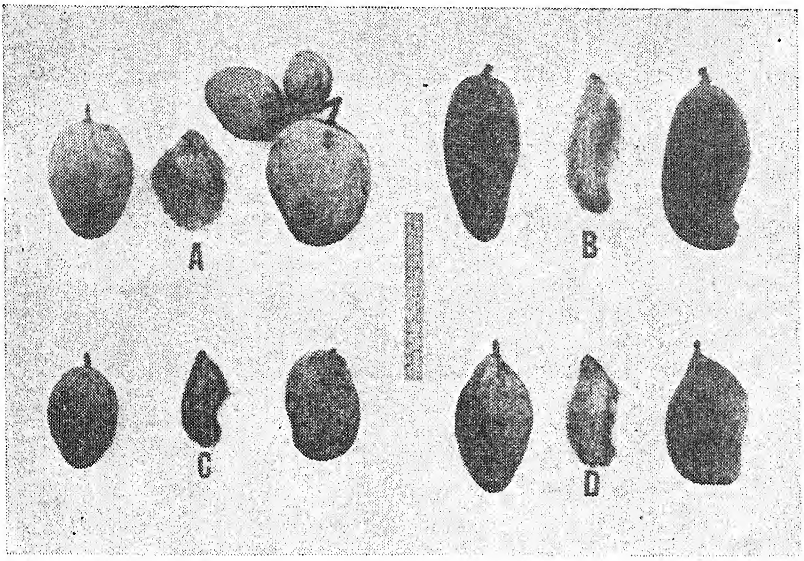

FIG. 2.—South African varieties of mango. A—Peach (note "small fruit" in relation to "normal"), B—Sabre, C—Kidney, D—Long Green.

The necessity for this depends on the fact that in the main only two varieties, the Sabre and Peach, are grown commercially in the Union; these are of unknown origin, and are propagated exclusively from seed. The fruit is not of the highest quality, the yield per tree is usually small, and the fruit is relatively susceptible to disease. Other seedling varieties which are rapidly falling out of commercial production are the Kidney and the Long Green because of an excessive degree of one or more of the foregoing factors. In Natal many other seedling types, such as the Rosella, Bombay Green, Carrot and others are grown, but only in small numbers and then usually in private gardens.

Seedling variants and hybrids of the commercial varieties are to be found in small numbers in all mango orchards due to the method of propagation, but only a few, such as the H.L.H., Monarein, and Jennifer have to date been singled out, named, and vegetatively propagated as new varieties because they possess desirable characteristics making them equal, if not superior, to the Sabre and Peach. A very promising field for the discovery of new varieties lies in such seedling orchards, and it would be well worth the time of growers to test fruit from, and observe, every individual tree in their orchards. Promising trees should be used as parent material for propagation by budding or grafting, as it cannot be known whether seedlings from such selected trees will be true to type.

Even in the case of the Sabre and Peach, selection for quality, high yielding, and regular bearing should be made, and the selected parent trees used for vegetative propagation. By such means throughout the centuries the present superior mango varieties grown elsewhere in the world have been developed, and the type of fruit referred to by some as "a piece of rope dipped in turpentine" eliminated.

To supplement the brief space devoted by Davis (1928) to mango varieties, the following descriptions of the main varieties grown in the Union are given, as such have not been published before.

Sabre.—This is a fairly large-sized fruit (length 4½ inches, major diameter 2½ inches, minor diameter 2 inches),* semi-reniform with equally rounded base and shoulders, the apex being broadly rounded and curved into a prominent beak with a slight nak. The smooth-surfaced tough leathery skin, yellow-green with bright red over-covering, is easily removed from the flesh. Flesh is deep-orange in colour with a melting texture and a medium amount of fibre. Eating quality is fair; sweet to insipid flavoured, turpentine taste present. Seed large and semi-reniform. Bearing quality average, fruit fairly resistant to disease, ripens mid-season, and very acceptable to the consuming public.

Peach.—Fruit failry large (length 3½ inches, major diameter 3 inches, minor diameter 2¾ inches), roundish oblique reniform in shape, slight depression at stem and equally rounded ventral and dorsal shoulders, the apex being broadly rounded with a depression on the ventral side and only a slight nak. Thick tough skin, smooth with white dots on exposed surface, the colour being apricot-yellow with pink to deeper red over-spread. Flesh orange to apricot-yellow in colour with tender juicy texture and fair amount of fibre. Eating quality is good; sweet flavour, and very slight turpentine taste present. Seed large and oval reniform. Bearing quality fair to poor, fairly resistant to disease, ripens mid to late season, and is the variety best-liked by the consuming public.

Long Green.—A fairly large variety (length 4½ inches, major diameter 3 inches, minor diameter 2¾ inches), with many sub-types, some of which are much larger fruited, the *Large Green* and *Bombay Green* often being grouped with this variety. Form obovate with a tapering flattened base and apex beaked and somewhat pointed, the nak being set high-up. The smooth thin leathery skin with pellucid dots separates easily from the creamy-yellow flesh, which has relatively little fibre. Considered the best eating mango in the Union. In certain areas crops well, but is extremely susceptible to anthracnose and black-spot, so that usually only a very small percentage of the crop reaches maturity on the tree when disease control is not practised.

Kidney.—Smallish fruit, kidney-shaped, with yellow skin and flesh. Many sub-types and hybrids exist. Flavour is excellent, but the fruit is very fibrous, and although an excellent cropper, is very susceptible to black-spot. Definitely going out of commercial favour.

The Ideal Mango.

It is not proposed to give descriptions of the best imported varieties here, as it will be quite a number of years before their propagation will have reached the stage where trees of such varieties can be obtained for commercial planting. In the ideal mango (1) the eating quality must be of the highest, that is, the fruit must peel easily, have a full flavour without a taste of turpentine in a melting flesh, and show such a complete absence of fibre that the fruit can be eaten with a spoon; (2) the not too small-sized fruit should have an attractive appearance; (3) the tree should crop well and, if possible, regularly; (4) the susceptibility of the fruit to disease should be slight; (5) the keeping quality and shipping quality for possible export should be good; (6) the fruit should be marketable at a period of highest prices, this depending on whether the variety is early or late-ripening and on the locality in which it is grown.

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* Fruit measurements here given are the average of several hundred fruits from different orchards.

The super-variety which embodies all the foregoing to the fullest degree has not yet been developed or discovered, but there are in the Union varieties now in bearing which show such distinct promise that their future commercial planting later cannot be doubted.

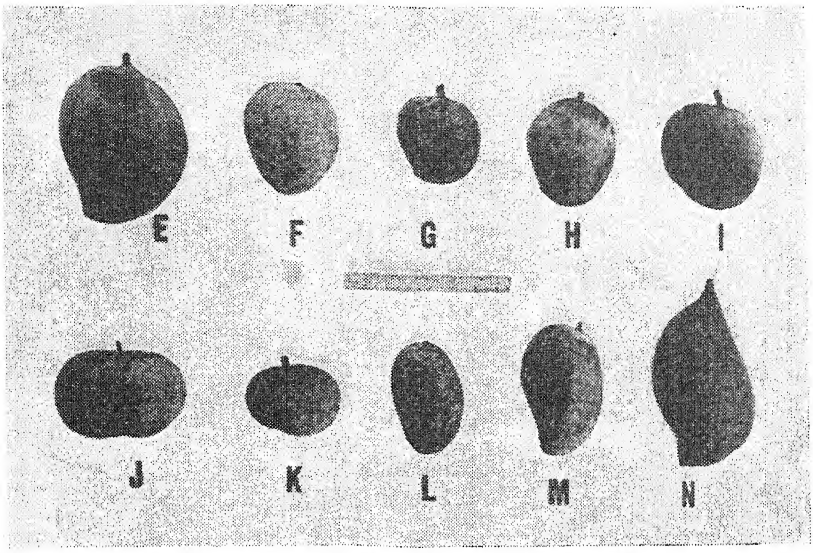

FIG. 3.—Some promising imported varieties of mango. E—Totapari Hyderabad, F—Mulgoba, G—Paheri, H—Singapur, I—Marina, J—Extrema, K—Santa Alexandrina, L—Aman Dusailri, M—Pico, N—Bangalosa.

Among these are.—

(*a*) the *Haden*, a precocious seedling of the poor-yielding *Mulgoba* group which originated in Florida, where it is now the leading variety;

(*b*) the *Paheri* (also *Pairi, Pirie*) noted by Pope (1929), in his description of mango varieties as among the best of all in cultivation;

(*c*) the *Bangalosa*, an extremely large-fruited late-maturing variety from Ceylon, apparently belonging to the *Sandersha* group, which, while lacking the luscious richness of the best mangoes, occupies a leading place in Florida and India;

(*d*) the *Alphonse* (also *Alfonso*) group which includes a number of variations, two introductions of these being unfortunately of the inferior types, but as the most celebrated and commonly grown mango in the State of Bombay the performance of two other introductions will have to be observed before it can be said that this group does not merit attention in the Union;

(*e*) the *Aman Dusailri* from Saharanpur which is a medium to small yellow-green fruit, not attractive in appearance, but of good eating quality and a heavy bearer;

(*f*) the *Extrema* and *Santa Alexandrina* from Brazil which are two apple-shaped stringless varieties whose rich and unusual flavoured melting flesh is said by some not to be that of a mango at all, but whose claim as excellent breakfast or dessert fruits will be difficult to contest.

Many other varieties, especially from Brazil, also show distinct promise, and while to date their greatest draw-back has been their very great susceptibility to disease, it is hoped that, when efficient disease control is practised, some of them will take a leading place amongst the best.

Wrong Application of Fertilizer.

J. H. Grobler, Lecturer in Chemistry, Grootfontein College of Agriculture, Middelburg, C.P.

IN applying fertilizer, the correct time and method are as important as the correct mixture or the correct quantity. There are two well-known methods of applying fertilizer. The first consists in even application over the whole field; the second is that of localized application, also known as row or hill application, around the plant.

Broadcasting fertilizer over the whole area, whether mixed with soil or not, means extra labour, apart from that of planting. Hill or row application is usually carried out by means of an apparatus attached to the planter and is therefore more economical, especially in view of the present shortage of farm labourers. It goes without saying that all fertilizer applied near the plant in the root zone can be reached by the roots, whereas in the case of the other method some of the fertilizer is wasted, which is the more undesirable with the present fertilizer shortage. In dryland farming, however, where the root system of plants attains a fairly wide horizontal spread in its search for water, it is better to broadcast the fertilizer.

The problem arises, however, of how to apply the fertilizer near enough to ensure maximum utilization without damaging the seed or seedlings by too high a concentration of salts.

For the correct placing of fertilizer, a knowledge of the movement of salts in the soil is necessary. Movement takes place mostly in the vertical plane, i.e., downwards after rain and upwards when evaporation takes place from the soil surface. Of the known fertilizers, nitrates move most readily, potash and ammonium salts somewhat less so and phosphates very little. This may be attributed partly to the fixation capacity of the soil for fertilizer. According to Sayre and Clark the fertilizers which damage or "burn" the young seedlings if applied wrongly, are mainly nitrate and potash fertilizers. They are more damaging in sandy soils and in hot, dry areas than in clayey soils and cold, moist areas. On the whole, legumes such as beans, soybeans and peas are more sensitive to damage of this type than other crops. A standard pattern for the application of fertilizer for all crops under all conditions is practically impossible. It has been found, however, that almost without exception better results are obtained by placing the fertilizer at the same depth as the seed. Applying the fertilizer near the seed at smaller depth, is an inferior method, for if it rains the fertilizer moves down and "burns" the seed, and if it remains dry the roots never reach it.

If the fertilizer is, however, applied near the seed and at the same depth, the latter germinates without coming into contact with the high concentration of salts; and when the root system develops, the fertilizer lies within the root zone. Research on various crops in different soils showed that for heavier applications, more crumbly soil and more sensitive crops, wider strips of fertilizer and wider spacing between fertilizer and seed will be required. The depth at which the fertilizer is to be applied, varies with the type of crop.

[*Continued on page 466.*

The Control of Pests in Stored Grain.

Dr. Bernard Smit, Principal Entomologist, Division of Entomology.

THE shortage of grain bags is going to be a serious problem on most farms for some time and the storage of our maize crop is going to be more difficult than usual on this account. All sorts of schemes have been suggested, but the fact remains that a great deal of the maize will have to be stored in bulk on the floors of sheds and storerooms. Comparatively few farmers are fortunate enough to have sufficient grain tanks to store all the maize they will have to keep on the farm. At the sheds of co-operative societies also, and even at the elevators, there will not be sufficient proper storage facilities to protect all the grain adequately.

Under such circumstances, the danger from damage by rats and mice and from the attack of weevils is much greater than usual, and this article is written to serve as a warning against these pests.

In the first place, the storerooms and sheds that are to be used for the storage of the maize crop should be made as rat-proof as possible. First, clean them thoroughly to remove all old grain that may be infested with weevils. Sweep down the rafters of the roof and ledges along the top of the walls to remove all dust, dirt, grain and any insects that may be lurking there. If there is old webbing from grain moths on the walls, it should be brushed down as well. Then sweep the floors and examine them for rat holes and cracks. The floors should be made of good solid concrete and all holes and cracks should be carefully cemented up. The walls of the store should also be plastered with good cement and be free from cracks. Examine doors and windows. The windows should be covered with galvanized gauze to make them insect- and rat-proof, but they may be left open for ventilation, unless there is danger of rain blowing in. Doors should fit well and they should be made rat-proof at the bottom by screwing on sheets of flat galvanized iron on each side.

To prevent rats and mice from getting into the roofs of storerooms from the outside, care should be taken not to stack such materials as old logs and timber against them, and all openings under the eaves and gutterings should be screened with wire gauze.

Before the new grain is put into the storeroom, the floors, walls and rafters should be well sprayed with 5 per cent. D.D.T. solution which should be allowed to dry, so that all surfaces are covered with fine crystals of D.D.T. Any insect which subsequently walks over this will soon die. The grain should be well dried before storing, because the drier it is the less susceptible it is to weevil attack. Grain which contains less than 8 per cent. of moisture will not be attacked at all. No matter what precautions are taken, the grain may be infested when it is put into the store, so that a careful watch must be kept for weevils while the grain is in storage. The weevils will probably not show up during the winter months, but in spring they begin to breed rapidly and can do very considerable damage in a short time. Rodent injury and weevil damage often go together. The rats spoil the grain and by urinating in it

make it very susceptible to weevil attack. Control the rats and mice, therefore, at all times with traps, poisons, calcium cyanide powder or with cats, wherever possible.

When grain is heavily infested with weevils, it must be fumigated with carbon bisulphide, but this is a dangerous and expensive process and is not very suited to the treatment of large quantities of grain in stores. It is far better to avoid the necessity for this by taking the above precautions and storing the grain in the right way from the time it is harvested.

Wrong Application of Fertilizer :—

[*Continued from page* 464.

For maize the following method may be tried: Strips one inch in width on both sides of the seed, on a plane one inch lower than the seed level. For applications exceeding 400 lb. per morgen, the strips may be wider.

For potatoes, 2-inch strips on both sides, 2 inches from the seed and level with the lower portion of the seed, are recommended.

In winter cereal planters the seed comes into contact with the fertilizer, but suitable machinery should be used to ensure a minimum loss of seed as a result of damage through burning. It is not sufficient, therefore, to apply the correct fertilizer in the correct quantities. The method of application should also be correct in order to derive maximum benefit from the available fertilizer.

New Bulletins.

The undermentioned Bulletins have recently been published :—

Bulletin No. 260., Nutrition of Poultry, Price 6d.

Bulletin No. 264., Turkeys, Price 3d.

These Bulletins are obtainable from the Editor of Publications, Department of Agriculture, Pretoria.

The Developed Merino Sheep and the Uniformity of its Fleece.

M. L. Botha, Sheep and Wool Research Officer, Grootfontein College of Agriculture, Middelburg, Cape.

THE lack of uniformity in wool growing on the body folds of merino sheep has always been the cause of serious discrimination against the developed type. Accurate experimentation has proved that wool growing on the body folds is stronger than that growing between folds. Evidence as to variability in length is lacking.

Length is one of the most important attributes in wool; the manufacturer desires good length in the spinning of high quality yarn, and length adds very materially to weight, on which basis the producer is paid. Therefore, it is highly desirable to have good and uniform length throughout the fleece.

During the judging of merino sheep at shows, the ring-side observer often hears the judge's criticism: "Good length but should show better length on the folds". The judge might well be asked whether the relatively small amount of wool on the crests of body folds is actually slower-growing wool than that of the rest of the fleece. Such a variation, if it existed, would be as objectionable as the variation of fibre diameter in wools on and between body folds.

Differences in length on and between body folds must be due to differences in rate of growth or to some other cause, and uneven shearing appears to be a most likely one. Developed sheep, and especially the excessively developed type, confront the shearer with great difficulty at shearing and it seems a likely explanation that the lack of length of wool on the body folds might be due to the shearer's inability to clip the wool uniformly short over areas on which folds occur.

Some preliminary observations were made at Grootfontein College of Agriculture to throw light on the subject of variation in length in fleeces grown by developed sheep. Three mature merino rams of the developed type were selected for the study. Sampling sites were prepared at the commencement of the growth period by clipping the wool close to the skin with special fine curved pointed scissors. Sampling sites were selected on the forequarters—inclusive of the apron folds on the hindquarters of the sheep, provision being made for corresponding pairs of small samples on and immediately off folds. After an exact period of 365 days, the wool samples were taken from the sites in the exact manner employed in preparing the sites a year previously, care being taken to avoid double cuts.

The following determinations were made on each of the 10 pairs of samples taken:— (1) staple length, (2) straight length, (3) coefficient of variation in straight length, (4) crimp ratio, that is, straight length: staple length, (5) fibre thickness, (6) coefficient of variation in fibre thickness, (7) number of crimps per inch, and (8) degree of medullation.

It is evident from the results that there is no significant difference in staple length, straight length and crimp ratio of the wool grown on, as opposed to off, folds. However, wool grown on folds is approximately 28 per cent. more variable in straight length; that is, the mean straight length for the two positions is the same, but the wool on folds is less uniform in length. The results, therefore, do not support the contention that wool grown on folds grows more slowly than wool off folds, and a sheep lacking in length on

its folds must be looked upon as lacking length in general. In these cases the apparent good length elsewhere can only be ascribed to faulty shearing.

The data also reveal that fold wool is stronger than the rest of the fleece by approximately 10 per cent., and that the former exhibits about 57 per cent. fewer crimps. These figures corroborate the findings of previous investigators who found that the wool on the folds is stronger and has fewer crimps than the wool of the rest of the fleece.

In respect of uniformity of fibre thickness and degree of medullation, no significant difference was established between samples grown on and off folds.

Further, the results of the study revealed that, judging by crimps per inch, the wool appeared finer than the measurements obtained by actual thickness measurements. This is not uncommon in the case of rams' wool.

In conclusion it can be stated that the wool growing on the apron and body folds of merino sheep is of the same staple length and straight length as the rest of the fleece, and any difference in length between wools grown on such adjacent regions must be ascribed to irregular sheering and not to a difference in growth rate. The wool on folds is more variable in straight length, it is stronger, and it has fewer crimps per inch than the wool off the folds.

Development of the Sheep Industry in the Orange Free State :—

[*Continued on page 454.*

6. Official Yearbook of the Union. 1910–1917.
7. (*a*) O.F.S. Census, 1856.
   (*b*) O.F.S. Census, 1880.
   (*c*) O.F.S. Census, 1890.
   (*d*) O.R.C. Census report, 1904.
   (*e*) Official Yearbooks of the Union : Various editions.
8. (*a*) Official Yearbook of the Union, No. 12.
   (*b*) Report on the Union Agricultural and Animal production, No. 12.
9. The reconstruction of Agriculture, 1943.
10. Journal of the Department of Agriculture, Union of South Africa, 1923.
11. „ Ondersoek na die agteruitgang van die Skaapboerdery in die suidoostelike Vrystaat." Not published.
12. Report of N.W.G.A. : Bloemfontein—October, 1946.
13. Government Veterinary office : Bloemfontein—April, 1946.
14. THOMLINSON, F. R.—„ Prysbewegings van Landbouprodukte : (elaborated by writer).
15. THOMLINSON, F. R.—Farming in South Africa. April, 1945.
16. FICK, J. S.—Young South Africa : October, 1943.
17. DE KLERK, J. C.—Farming in South Africa : February, 1946.
18. White paper on Agricultural policy, 1946.
19. Soil Conservation Act, No. 45 of 1946.

The Farm Home.

(A section devoted mainly to the interests of Farm Women.)

Removal of Stains.

Miss Elma du Preez, Home Economics Officer, Department of Agriculture.

THE purpose of dry cleaning is to clean clothing in such a way that it does not shrink, crease, bleach or lose its colour. It is essential that every housewife should know something about the simpler processes of dry cleaning, since most stains can be removed at home, provided a little care and a few simple precautions are taken.

Methods of Cleaning.

There are three different methods:—

1. *The use of absorbents* such as mealiemeal, bran, chalk, magnesia powder, fuller's earth, etc.

This method can only be applied when the article is not very dirty. If the absorbent is heated in an oven, it will prove more effective. It is sprinkled over the whole upper surface and thoroughly rubbed into the dirtier spots. The article is then rolled up tightly and covered with a towel and left for a few hours or overnight. The powder is then brushed out and the process can be repeated, if necessary. This method can also be used on felt hats which need cleaning.

2. *The use of solvents.*—Water may be used for the removal of non-greasy stains. For stains of a fatty nature use petrol, benzine, turpentine, carbon tetrachloride, eucalyptus oil or methylated spirits, but since all of these substances except carbon tetrachloride are inflammable, great care must be exercised when handling them.

3. *A combination of methods one and two.*—Make a paste of an absorbent and a solvent, e.g. benzine and chalk. The mixture is rubbed on to the upper surface of the article to be cleaned, allowed to dry and then brushed off. Repeat the process if necessary. This is a very effective method for cleaning felt hats.

It is important to remember that all fatty stains must be dry before a solvent is used.

How to Dip an Article in Benzine.

Stains of a non-fatty nature must first be removed with water or an absorbent and the material allowed to dry. Then shake out thoroughly and dip the article into enough benzine to cover it. Portions which are very dirty should be rubbed lightly and rinsed in benzine once or twice.

After the article has been thoroughly rinsed, it is hung up in the shade. Iron with a damp cloth; the heat of the iron and the dampness of the cloth will help to remove the benzine smell. Buttons need not be removed, but pearl buttons will lose their gloss and wooden buttons will also be spoilt if they are not removed. The benzine can be allowed to stand for the dirt to settle, strained, and used again. Old benzine has a stronger smell and the article will have to be cured for a longer period.

Detergents.

These can be used to remove separate stains or, in the case of mens' suits, to clean whole upper surfaces. All soapiness must be thoroughly sponged out after the article has been cleaned. Dyes may be affected by a detergent which must therefore first be tested out on the article before being used.

A useful detergent may be made up as follows:—

1 oz. ether.	1½ oz. good white soap.
1 oz. alcohol.	14 cups soft water.
3 oz. ammonia.	

Cut up the soap and beat it in 2 cups of water until dissolved. Add the rest of the water and other ingredients. Keep tightly corked in a jar.

If used as a general cleaning agent, it must be mixed with equal quantities of hot water.

The following mixture is very effective for removing scorch stains:—

1 grated onion.	2 oz. soap.
¼ pint vinegar.	1 oz. fuller's earth.

Grate the soap and add it to the onion and vinegar together with the fuller's earth. Place the mixture in a saucepan and boil for 10 minutes. Strain and keep in a tightly corked bottle. This mixture is used by spreading a small quantity over the surface of the garment and allowing to dry. Then it is brushed out well. Repeat the process if necessary. *Logwood* is used for dark-coloured articles to revive their colour. The dye is prepared by boiling 1 cup of logwood in 2 pints of water. For cleaning dark blue or black articles, e.g. gyms, a little ink and enough ammonia to blacken the blue are added.

Points to Remember.

(1) Treat the stain as soon as possible, since chemical changes may take place through exposure to air, drying of the stain, or washing. In this way stains become more fixed, with the result that stronger reagents have to be used. Sometimes the stain becomes so fixed that it is impossible to remove it without damaging the fibre. With the exception of greasy stains, all stains must be rinsed out immediately in cold or lukewarm water, but never in hot water.

(2) Determine the nature of the stain because upon this depends the correct treatment. Incorrect treatment as, for example, ironing a blood stain, may set the stain instead of removing it. Soap will set fruit stains owing to the reaction of the soap on the acid in the fruit juice.

(3) Examine the fabric and treat the stain with the reagent which will be least detrimental to the material. Always treat coloured articles with care. If possible, first test the reagent on a piece of the same material. Use weak reagents at intervals and confine their application to the stained surface. Use acid on wool and silk, but not on cotton and linen. For the latter use alkalis which, in turn, are not suitable for animal fibres. Strong acids or the repeated use of any of these chemicals will destroy all fibres. Rayons should be treated with special care since strong acetic acid will dissolve acetate rayon and even a weak alkali will turn white rayon yellow.

General Procedure for the Removal of Stains.

1. *Non-greasy Stains.*—(*a*) Stretch the stained material over a bowl and keep it in position with elastic or string; (*b*) damp the stain, using a medicinal dropper or glass rod; and (*c*) apply the reagent in the same way and rinse the stain after each application. Repeat as often as is necessary and rinse thoroughly after each application.

2. *Grease Stains.*—Grease removers must always be used on the dry material. Lay the stained article with the right side of the stain on a piece of absorbent cloth or material, and rub the stain, on its wrong side, with an absorbent cloth which has been dipped into the remover. If possible, use a cloth which has the same colour and texture as the stained material.

Classification of Stain Removers.

1. *Absorbents*—e.g. blotting paper, starch, fuller's earth, magnesia powder, mealiemeal and bran.

These substances do not have a detrimental effect on the material, and are more effective if heated.

2. *Grease solvents.*—(*a*) Carbon tetrachloride and other non-inflammable liquids containing chlorine which are excellent for removing oil, fat, tar or resin stains.

(*b*) Benzine, petrol, turpentine, alcohol, methylated spirits, and paraffin which are all inflammable, and should be handled very carefully.

(*c*) A mixture of (*a*) and (*b*). The former evaporate more rapidly than the latter. Remember that the mixture is not always non-inflammable. Carbon tetrachloride has no detrimental effect on colour or fibre. Petrol and benzine may affect certain dyes. Alcohol affects certain dyes and acetate rayon. Turpentine may affect some dyes, but will not damage the fibre. Paraffin has no harmful effect on either dyes or fibres.

3. *Acid solvents*, e.g. oxalic acid, hydrochloric acid, lemon juice and vinegar (acetic acid), salts of lemon and tartaric acid, the first-mentioned being most commonly used.

(*a*) The correct strength for oxalic acid is 2 teaspoons in 1 pint of water, a warm solution being more effective that a cold one. This substance is very poisonous, so label it carefully. It bleaches coloured articles, and a concentrated solution will dissolve vegetable fibres, e.g. cotton and linen.

(*b*) Dilute 1 part of concentrated hydrochloric acid with 9 parts water. This acid removes most stains, but is detrimental to all fibres and will bleach coloured articles. It is used for white silk or wool and, if very dilute, for white cotton or linen.

(*c*) Lemon juice in combination with salt and sun is more effective than other acids as it does not affect the fibre.

(*d*) Vinegar contains from 4—5 per cent.acetic acid and has no detrimental effect on dyes. If acetic acid crystals are used, dissolve 1 oz. in 1 pint water. A concentrated solution is safe for all fibres except acetate rayon.

(*e*) The commonest method of using salts of lemon is to place the crystals on the stain and moisten them with water. This substance may damage the fibre and, if not thoroughly rinsed out, may also affect dyes.

(*f*) In the case of tartaric acid, dissolve 1 teaspoonful in 1 pint water; it may affect dyes.

4. *Bleachers.*—These may be divided into 2 classes, namely (i) alkalis such as Javelle water, chloride of lime (bleaching powder), potassium permanganate (which must never be used alone but with alternate applications of an acid, such as oxalic acid, as it leaves a brown stain), ammonia, etc.; and (ii) acids, such as oxalic acid.

(*a*) *Javelle water* is prepared by mixing together 1 lb. washing soda dissolved in 4 cups boiling water with ½ lb. chloride of lime dissolved in 4 cups cold water. After stirring, leave the precipitate to settle and pour off the top, straining the liquid through a white cloth. Store Javelle water in dark jars, but do not keep it too long as it deteriorates. Use the full strength for stains.

(*b*) Chloride of lime is prepared by dissolving 2 T. in 4 c. water. For use, mix 1 T. of the liquid with 1 c. water.

Both (*a*) and (*b*) are never used on silks or wools or coloured articles.

(*c*) *Potassium permanganate.*—1 teaspoonful crystals in 1 pint water. It is safe on all white fibres with the exception of white artificial silk. Apply it alternately with oxalic acid to the stain.

(*d*) *Hydrogen peroxide.*—A little acid is added to make it more stable but before using the peroxide add a few drops of ammonia to counteract the acid. It has no detrimental effect on materials as long as it is washed out afterwards, but may affect dyes.

(*e*) *Ammonia.*—Household ammonia must not be used as it contains soap. A 10 per cent. solution may be used with safety on all fibres, but it may affect coloured articles.

(*f*) *Sodium thiosulphate.*— 1 teaspoonful in 1 c. water. This may affect coloured articles and fibres, but is very effective for iodine stains.

(*g*) *Sodium hydrosulphate.*—1 teaspoonful in 1 c. water. It may affect coloured articles. A fresh solution must be made each time it is required, as it deteriorates very quickly.

5. *Dissolving agents*, such as banana oil and amyl acetate. The latter affects some dyes, but is safe for all fibres except acetate rayon.

Stain Removal Chart.

Stain.	Material.	Treatment and Remover.
1. Blood (protein stain)	Washable.........	(a) Cold water. (b) Soak in a salt solution 1–8 water. (c) Dilute ammonia. (d) For stubborn stain, soak in salt water for 1 to 2 hours; then treat with one of the following:—Hydrogen peroxide, potassium permanganate, Javelle water.
	Non-washable.....	(a) Cold water. (b) A mixture of starch and water in the form of a paste, and allow to dry. (c) Hydrogen peroxide.
2. Candle wax.....	Washable.........	(a) Scratch off as much as possible. (b) Iron over brown paper or blotting paper. (c) Treat with turpentine or paraffin. (d) Wash in warm soapy water.
	Non-washable.....	(a) Same as for washable material. (b) Carbon tetrachloride or benzine; wood alcohol used to remove colouring. (c) Hydrogen peroxide.
3. Chewing gum...	Washable.........	(a) Scrape off as much as possible. (b) Rub spot with piece of ice. (c) Wash. (d) Use turpentine, paraffin or carbon tetrachloride.
	Non-washable.....	(a) Same as for washable material. (b) Carbon tetrachloride.
4. Coffee and Tea..	Washable.........	(a) If milk present, first get rid of the protein. (b) Lemon juice, salt and sunlight or warm glycerine (dissolves tannic acid). (c) A paste of borax. (d) Potassium permanganate. (e) Boiling water poured from a height; use kettle. (f) Javelle water.
	Non-washable.....	(a) Sponge with lukewarm water. (b) Hydrogen peroxide.
5. Chocolate or Cocoa........	Washable.........	(a) Sponge with lukewarm water. (b) Wash. (c) Wood alcohol and a few drops of ammonia.
	Non-washable.....	(a) Sponge with water. (b) Carbon tetrachloride. (c) Hydrogen peroxide.
6. Rust...........	Washable.........	(a) Lemon juice. (b) Oxalic acid. (c) Salts of lemon. (d) Tartaric acid, hydrochloric acid.
	Non-washable.....	(a) Oxalic acid. (b) Lemon juice.
7. Egg............	Washable.........	(a) Sponge with cold or lukewarm water. (b) Hydrogen peroxide to bleach.
	Non-washable.....	(a) Cold water. (b) Sponge with a fat solvent such as benzine. (c) Hydrogen peroxide.

Stain.	Material.	Treatment and Remover.
8. Perspiration, etc.	Washable.........	(*a*) Sponge immediately. (*b*) If yellow stains remain, use hydrogen peroxide. (*c*) If colour has been affected, hold article over the fumes of an ammonia bottle. (*d*) Lemon juice for old stain. (*e*) Javelle water or potassium permanganate. (*f*) Soak for one hour in vinegar water (½ c. in 1 pint water). Treat with weak ammonia or borax water.
	Non-washable.....	(*a*) Sponge with water. (*b*) Lysterine may be used to remove smell.
9. Paint and Varnish	Washable........	(*a*) When old, such stains are difficult to remove as a result of oxidation which forms less soluble compounds. Scratch off as much as possible. (*b*) Soak in turpentine, pork fat or butter. (*c*) Wash in warm soapy water. (*d*) Boil in washing-soda water (3 T. in 1 gal. water).
	Non-washable......	Turpentine, alcohol or banana oil.
10. Nail Polish......	Washable.........	(*a*) Acetone not used on acetate rayon. Methylated spirits. (*b*) Banana oil.
	Non-washable.....	Except for acetone, same as for washable.
11. Mould..........	Washable.........	(*a*) Lemon juice, salt and sunlight. (*b*) Oxalic acid. (*c*) Hydrogen peroxide, potassium permanganate and Javelle water.
	Non-washable.....	(*a*) Lemon juice, salt, etc. (*b*) Hydrogen peroxide.
12. Mustard.........	Washable.........	(*a*) Soap and water. (*b*) Diluted ammonia. (*c*) Hypo.
	Non-washable.....	(*a*) Make paste of starch and water. (*b*) Wood alcohol. (*c*) Alcohol followed by ammonia.
13. Iodine..........	Washable.........	(*a*) Soap and water. (*b*) Dilute ammonia. (*c*) Hypo.
	Non-washable.....	(*a*) Make paste of starch and water. (*b*) Wood alcohol. (*c*) Alcohol followed by ammonia.
14. Lipstick.........	Washable.........	(*a*) Treat immediately. Rub with pork fat and wash in hot soapy water. (*b*) Hydrogen peroxide, Javelle water.
	Non-washable.....	(*a*) Carbon tetrachloride. (*b*) Banana oil. (*c*) Hydrogen peroxide.
15. Grass..........	Washable.........	(*a*) Wash immediately. (*b*) Alcohol. (*c*) Hydrogen peroxide, potassium permanganate or Javelle water.
	Non-washable......	Alcohol.
16. Fats, Oil, Tar....	Washable	(*a*) Remove as quickly as possible in warm soapy water. (*b*) Rub with lard and wash afterwards, especially for grease stains.

Stain.	Material.	Treatment and Remover.
16. (*Continued.*)	Washable.	(*c*) Dirty oil contains carbon solids and other minerals which may remain behind after the oil is removed. To remove them, use the following mixture: 1 T. turpentine, 1 T. soft soap and 1 t. methylated spirits. (*d*) If badly stained, boil as for paint.
	Non-washable.	(*a*) Talc on fresh stains, brush out and repeat. (*b*) Carbon tetrachloride, etc.
17. Ink. (*a*) Writing Ink..	Washable.	(*a*) First remove the iron with an acid. (*b*) Bleach with potassium permanganate or hydrogen peroxide.
(*b*) Marking ink..	Washable.	(*a*) Iodine or acid bleaching powder followed by concentrated hypo. (*b*) Treat with potassium permanganate followed by acid, or hydrogen peroxide.
(*c*) Indian ink....	Washable.	(*a*) Treat with a dissolved soap. (*b*) Bleach.
(*d*) Printer's ink..	Washable.	Same as for Indian ink.
(*e*) Red ink......	Washable.	(*a*) Soak for a few minutes in hot water and borax. (*b*) Methylated spirits.
18. Medicines.......	Washable.	(*a*) Use alcohol. (*b*) Bleaching agent. (*c*) If medicine contains sugar, sponge with water and then bleach. (*d*) If it contains iron, treat with acid.
19. Dyes...........	Washable.	(*a*) Water and sunlight. (*b*) Sodium hydrosulphate and rinse in ammonia water. (*c*) Glycerine. (*d*) Bleaching agent. (*e*) Soak in methylated spirits to which a few drops of ammonia have been added.
20. Shoe Polish. (*a*) Black polish..	Washable.	(*a*) Use turpentine. (*b*) Carbon tetrachloride. (*c*) Lard.
(*b*) Brown polish.	Washable.	(*a*) Warm water and soap. (*b*) Wood alcohol. (*c*) Bleaching agent.
21. Fruit juices.....	Washable.	As fruit juices sometimes contain tannic acid, do not use soap before other reagents. Boiled fruit juices are easier to remove than fresh fruit juices. (*a*) Boiling water poured from a height. (*b*) Lemon juice, salt and sunlight. (*c*) Glycerine—heat. (*d*) Bleaching agents, sodium hydrosulphate.
	Non-washable.	(*a*) Sponge with hot water. (*b*) 10% acetic acid. (*c*) Hydrogen peroxide.
22. Scorch..........	Washable.	(*a*) Moisten and leave in the sun. (*b*) Hydrogen peroxide. (*c*) Woollen articles may be rubbed with sandpaper. (*d*) Bleaching powder on woollen articles and linens. (*e*) Borax.
	Non-washable.	Hydrogen peroxide.

Stain.	Material.	Treatment and Remover.
23. Water marks....	Washable.........	(a) Dampen the whole upper surface and iron. (b) Steam.
24. Meat juice or gravy.	Washable.........	Sponge stain with luke warm water—never hot water as it sets the stain. If a grease spot remains, launder washable materials in warm soapy water.
	Non-washable.....	(a) Absorbents—dust the powder over stain. Let it stand until it absorbs the grease, then brush off. (b) Solvents—sponge with carbon tetrachloride or benzine.
25. Metallic stains. (a) Copper, brass and tin	Washable.........	(a) Apply vinegar, lemon juice. (b) Rinse. (c) Do not use chlorine bleaches.
(b) Lead or solder stains.........	Washable.........	Mercury will remove the stains. First scrape off as much as possible; then apply mercury with a stick until the stain is absorbed.
26. Tobacco stains...	Washable.........	(a) Cold water and glycerine, sponge with cold water. (b) Work warm glycerine into stain and allow to stand for ½ hour. (c) Wash with soap and water. (d) If stain cannot be completely removed, bleach in the sun. (e) Moisten with lemon juice before bleaching. (f) Wood alcohol. (g) Javelle water.
27. Enamel.........	Non-washable.....	New stains may be removed by rubbing lightly with a cloth dipped in turpentine or petrol. If this does not remove the stain allow to soak for a while in the solvent.
28. Ice-cream.......	Washable.........	(a) Sponge with hot water. (b) Wash.
	Non-washable.....	(a) Sponge with hot water. (b) Use carbon tetrachloride.
29. Jam and preserves.	Washable.........	(a) Sponge with hot water. (b) Soak in a little hot water and borax.
30. Milk............	Washable.........	(a) Sponge with cold water. (b) Wash.
	Non-washable.....	(a) Sponge with cold water. (b) Grease solvent.
31. Shiny patches on woollen materials		Brush lightly with a rubber or fine wire brush. In the case of navy blue or black material, sponge with ammonia and water and iron under a damp cloth.
32. Soot............	Washable and Non-washable.........	Remove with tetrachloride. Do not treat with water.
33. Unknown stain.	Washable.........	(a) Sponge with water. (b) If greasy in appearance, try a grease solvent. (c) Treat alternately with potassium permanganate and peroxide or oxalic acid in the case of white material.

Crops and Markets

A Statistical and Economic Review of South African Agriculture

by

The Division of Economics and Markets

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CONTENTS

Price Review for March 1947.*

Fruit.—Except for apples which were plentiful, offerings of deciduous fruit, particularly peaches, pears and grapes, decreased sharply on the markets, and experienced a strong demand. The markets were, however, well supplied with avocados, guavas and pineapples which were disposed of at satisfactory prices.

Tomatoes.—Smaller consignments of tomatoes reached the markets, and prices, particularly in the case of tomatoes of good quality, showed a further increase. On the Johannesburg market the prices of National Mark No. 1 tomatoes increased from 5s. 6d. to 7s. 10d. per tray, and ordinary tomatoes on the Cape Town market from 3s. 4d. to 4s. per tray.

Potatoes.—Potatoes still appeared in large quantities on the markets, and further price reductions took effect. For example, on the Johannesburg market, the prices of Transvaal potatoes, grade 1, fell from 10s. 1d. to 9s. 6d. per bag; those of Orange Free State potatoes on the Durban market from 12s. 11d. to 9s. 10d. per bag; and those of Cape potatoes on the Cape Town market from 15s. 5d. to 12s. 9d. per bag.

Onions.—Except for the Durban market which was well supplied, the supply of onions decreased further, and prices increased appreciably. For example, on the Johannesburg market, the prices of Transvaal onions increased from 14s. 8d. to 17s. 6d. per bag; those of Cape onions on Cape Town market from 11s. 9d. to 14s. 3d. per bag and those of Cape onions on the Pretoria market from 13s. 7d. to 20s. 3d. per bag. On the Durban market, however, the prices of local onions declined from 16s. 1d. per bag in February to 13s. 4d. per bag in March.

Vegetables.— Except for pumpkins which were plentiful, vegetable offerings decreased on the markets, particularly in the case of green peas, carrots and cabbage.

* All prices mentioned are averages.

Seed, Grain and Fodder.—Moderate quantities of sweet grass were offered, and were disposed of satisfactorily, but teff hay, particularly of good quality, was scarce. Insufficient lucerne offerings realized high prices in spite of the poor quality.

Eggs and Poultry.—The egg supply was limited, and prices were generally high. Further increases in the maximum wholesale and retail prices of eggs were announced during April. Good quantities of poultry were available on the Johannesburg market and high prices were realized, particularly for poultry of good quality.

Review of the Wool Market.—During March, 1947, a total of 45,037 bales of wool was offered for sale in Union ports, of which 34,390 bales (73 per cent.) were sold.

Competition was keen, particularly for short wool and grassveld wool which were offered in limited quantities. The average prices for most types of wool were higher than those of the previous month.

Index of Prices of Field Crops and Pastoral Products.

This index, as shown elsewhere, remained unchanged for March, 1947, viz., at 203.

The most important changes occurred in the following groups:—

(*a*) "Hay" increased from 127 to 154, particularly as a result of an increase in lucerne prices.

(*b*) "Pastoral Products" increased from 187 to 189 due to a further increase in the average wool prices.

(*c*) "Slaughter Stock" decreased from 191 to 182, as a result of the reduction in the seasonal price of slaughter cattle in controlled areas.

(*d*) "Poultry and Poultry products" increased from 248 to 251 in March, due particularly to a further increase in the prices of eggs.

Agricultural Conditions in the Union during March, 1947.

Weather Conditions.—Scattered light showers of rain occurred in all four provinces, especially in the eastern parts of the country, viz., the Transvaal highveld, north-eastern Orange Free State, Natal, Transkei and the Border area of the Cape Province. The western parts of the country, particularly the western and southern Orange Free State and western Transvaal had, however, very little rain and severe drought conditions prevailed in some parts.

Crops.—Summer cereal crops were still promising, especially in the eastern parts. Record crops were expected, for example in Natal, while prospects in the Transkei were also very promising. In the western Orange Free State and western Transvaal summer cereals had already suffered severely with the result that yields would not be according to earlier prospects. Rain was urgently needed to improve the prospects.

Stock and Pastures.—As a result of the scattered showers of rain the condition of stock and pastures varied. With the exception of areas where good showers of rain occurred, timely rains were necessary for the pastures and water supplies, especially in the western and southern Orange Free State and the north-western Cape Province. Except for lumpy skin disease and nagana which still occurred in Natal, stock diseases were quiet.

Maximum Prices of Eggs.

The maximum wholesale and retail prices of eggs in controlled areas fixed on 7 March 1947 have been increased all round by a further 3d. per dozen for each grade as from 11 April 1947. Prices are now as follows:—

Description of Eggs.	Maximum Price Per Dozen.	
	Wholesale.	Retail.
	s. d.	s. d.
Grade I:—		
(*a*) Extra Large	4 1	4 5
(*b*) Large	3 11	4 3
(*c*) Medium	3 9	4 1
(*d*) Small	3 7	3 11
Grade II:—		
(*a*) Large	3 9	4 1
(*b*) Medium	3 7	3 11
(*c*) Small	3 5	3 9
Grade III:—		
Mixed	3 6	3 6

The maximum price at which eggs may be sold in uncontrolled areas has been fixed at 3s. 11d. per dozen (See *Government Gazette Extraordinary* of 11 April 1947.)

The 1947 Citrus Control Scheme.

SINCE the outbreak of the war when the export of citrus fruit decreased sharply, a Citrus Board has been established in order to exercise control over the local disposal of these export fruits. For this purpose certain powers were granted to the Board.

The first citrus control scheme took effect on 1 January 1940 and two months later it was continued under a War Measure. A pool system has been created under the scheme in order to secure equal treatment to all growers.

Until 1942 the Board controlled only the fruit of export growers. In 1942, however, a measure of control was also exercised over non-exporters and full control as from 1943.

On 1 March 1946 the new post-war marketing policy of the Citrus Board came into operation. Since 1946 the fruit of growers selling less than 1,000 pockets of citrus fruit per season, i.e. non-exporters, was free from control. Formerly a levy of 5s. per ton

was imposed only on all fruit exported. Since 1946, however, a levy has also been placed on citrus fruit sold locally, viz., 1½d. per pocket for 1st grade citrus fruit and 1d. per pocket for 2nd grade. Only exporters paid this levy, i.e. growers marketing more than a 1,000 pockets of citrus fruit per season.

As from 1947 the new citrus control scheme came into operation under the Marketing Act. The following are the most important amendments effected under the new scheme:—

(*a*) The pooling of the proceeds of sale of the export quality oranges, grapefruit and lemons belonging to exporters will be done on the basis of variety and weight category, instead of variety and count.

(*b*) Each exporter is directed to export 75 per cent. of his export quality fruit and to sell 25 per cent. of it locally. All these will then participate in the export pool. If the exporter packed less than the prescribed 75 per cent., the balance will participate only in the first grade local market pool.

(*c*) The basis on which non-exporters were determined (viz. growers of less than a 1,000 pockets of citrus fruit per season) was unsatisfactory and has been changed to the number of trees. As from 1947, therefore, all growers who have a total of 300 citrus trees (i.e. sweet orange, grapefruit and lemon, other than rough lemon) will not be subject to control, provided they comply, where required to do so, with the grading and packing regulations. They also do not pay a levy. The trees of growers having more than 300 trees will, however, be controlled and the proceeds of sales will be pooled. They will again pay the levy of 5s. per ton on fruit exported and 1½d. and 1d. per pocket on 1st and 2nd grade citrus fruit, respectively, marketed locally.

(*d*) Only five varieties instead of seven, as was the case previously, will be recognized in 1947.

Prices of Citrus Fruit.—The maximum prices of oranges, grapefruit and lemons for the 1947 season were announced recently. (See *Government Gazette Extraordinary* of 11 April 1947.) The prices of oranges per pocket have been fixed as follows as from 11 April 1947.

	Producers' Prices.	*Wholesale Prices.*	*Retail Prices.*
	s. d.	s. d.	s. d.
1. *First Grade*:			
(*a*) Extra Large	4 3	4 6	5 0
(*b*) Large	4 0	4 3	4 9
(*c*) Medium	3 9	4 0	4 6
2. *Second Grade*:			
(*a*) Extra Large	3 6	3 9	4 3
(*b*) Large	3 0	3 3	3 9
(*c*) Medium	2 9	3 0	3 6
(*d*) Small	2 3	2 6	3 0
3. *Third Grade*:			
(Unsized)	2 3	2 6	3 0

(See *Government Gazette Extraordinary* of 11 April 1947.)

The above prices are 6d. per pocket higher for all grades than those fixed on 12 April 1946 for the previous season. Corresponding prices of grapefruit and lemons are 3d. per pocket higher in all cases than those of the previous season.

Average Prices of Apples, Pears and Grapes on Municipal Markets.

SEASON (1 July to 30 June).	APPLES (Bushel box).						PEARS (Bushel box).		GRAPES (Tray).
	Johannesburg.			Cape Town.			Johannesburg.		Johannesburg.
	Oheni-muri.	White Winter Pear-main.	Wem-mers-hoek.	Oheni-muri.	White Winter Pear-main.	Wem-mers-hoek.	N.M. No. 1.	Other.	All kinds.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39.......	7 2	6 0	5 10	7 3	8 0	4 3	6 7	4 2	1 3
1940–41.......	8 4	7 1	6 4	8 11	10 8	5 0	8 11	6 3	1 8
1941–42.......	8 11	7 11	7 3	9 1	10 9	6 9	7 3	8 0	1 11
1942–43.......	14 9	11 6	9 1	10 8	12 11	6 11	—	10 8	1 10
1943–44.......	12 2	11 3	9 11	13 10	11 2	5 10	—	14 11	3 7
1944–45.......	14 9	13 5	11 6	12 0	12 0	8 3	—	13 2	6 10
1946—									
January.......	18 8	22 10	—	—	—	—	—	15 9	3 7
February......	15 6	13 7	12 9	15 5	15 2	5 6	—	13 4	1 5
March.........	12 11	14 4	16 11	12 10	14 1	12 8	—	13 5	3 6
April..........	13 1	13 2	13 5	13 4	14 3	15 2	—	15 3	—
May............	19 8	20 3	21 3	16 2	20 4	15 2	—	17 10	—
June..........	22 8	23 2	22 6	17 9	21 2	13 8	—	—	—
July..........	21 3	22 10	18 10	14 5	19 2	—	—	—	2 11
August........	21 7	22 11	20 2	16 3	18 3	—	—	—	12 4
September.....	19 1	20 6	—	15 10	21 0	—	—	—	8 1
October.......	21 8	20 0	—	15 3	22 7	—	—	—	—
November.....	24 4	18 6	—	17 5	25 6	—	—	—	—
December......	14 8	17 4	—	36 4	40 0	—	—	7 6	7 4
1947—									
January.......	18 0	16 7	—	27 6	—	—	—	9 5	4 5
February......	19 8	14 5	—	19 7	—	—	—	11 2	4 7
March.........	12 3	10 5	17 8	12 0	19 3	—	—	13 9	1 10

Prices of Avocados and Papaws on Municipal Markets.

SEASON	AVOCADOS (Per Tray). (a)				PAPAWS. (b)					
	Cape Town.	Durban.	Johannesburg.		Cape Town Std. Box.	Durban. Tray.	Johannesburg.		Port Elizabeth Std. Box.	Bloemfontein Std. Box.
			Ordinary.	N.M.			Ordinary Std. Box.	N.M. Std. Box.		
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39.........	1 6	0 11	1 3	1 11	2 0	0 10	1 7	2 0	2 0	1 8
1939–40.........	2 1	1 2	1 9	2 11	2 3	0 10	1 4	1 9	1 11	1 6
1940–41.........	1 10	0 10	1 5	2 4	2 1	1 1	1 9	2 2	2 3	1 9
1941–42.........	2 4	1 7	2 1	3 4	2 5	0 10	1 10	2 1	1 11	2 0
1942–43.........	3 1	1 8	2 10	4 3	3 2	1 2	2 1	2 7	2 2	2 0
1943–44.........	4 1	1 6	3 7	5 3	3 2	1 5	2 5	3 5	3 3	2 7
1944–45.........	—	—	—	—	3 4	1 6	3 1	4 1	3 5	3 0
1946—										
January.......	8 1	1 8	5 10	9 2	3 10	1 6	4 5	7 11	6 4	3 11
February......	3 4	0 10	3 1	5 0	2 10	1 5	7 1	5 6	5 6	4 7
March.........	2 11	3 7	2 8	4 0	—	1 1	6 6	7 8	6 4	5 8
April.........	2 8	1 11	3 4	4 9	5 5	1 1	5 6	7 11	6 3	4 6
May...........	3 0	1 10	3 7	5 5	5 1	1 1	4 9	5 8	4 7	4 2
June..........	3 6	2 3	4 5	6 4	3 8	2 5	4 10	5 9	5 2	4 0
July..........	4 1	1 9	5 6	6 3	4 11	2 7	5 4	6 0	6 3	4 11
August.........	5 7	5 1	5 10	6 8	5 1	2 6	4 4	5 1	4 9	4 4
September.....	9 3	—	6 5	5 8	2 10	1 6	2 8	3 2	2 3	2 11
October........	8 8	4 7	5 11	6 7	2 5	1 4	1 9	2 4	2 2	1 10
November......	8 6	3 6	6 3	7 4	2 8	0 8	2 3	2 11	2 11	2 8
December......	8 9	2 0	5 11	8 3	3 7	1 9	3 7	4 8	4 11	2 6
1947—										
January.......	7 11	—	5 5	—	4 6	1 8	4 10	6 6	8 0	3 9
February.......	2 6	—	2 11	—	4 9	1 5	7 10	—	8 11	—
March.........	2 0	—	2 11	3 11	6 5	3 10	8 2	8 1	—	3 5

(a) Season 1 January to 31 December.
(b) Season 1 April to 31 March.

Prices of Bananas and Pineapples on Municipal Markets.

SEASON.	BANANAS (Per Crate) (a)			PINEAPPLES. (b)						
	Cape Town.	Johannesburg.	Pretoria.	Cape Town. Box.	Durban. Doz.	Johannesburg. Ordinary. Doz.	Johannesburg. Queens and Giants. Doz.	Port Elizabeth. Box.	East London. Doz. Large.	Bloemfontein. Bushel Box.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	22 5	9 10	16 5	5 4	3 3	1 1	—	3 5	1 2	4 10
1939–40	24 4	8 7	15 10	6 1	3 10	1 4	4 8	3 10	1 5	4 9
1940–41	27 0	7 2	14 3	5 10	2 8	1 5	2 1	4 5	1 5	5 10
1941–42	28 6	7 6	14 6	6 6	3 0	1 7	2 5	4 6	1 8	6 2
1942–43	30 0	11 9	22 7	7 4	3 0	1 8	3 10	4 11	2 1	7 3
1943–44	37 8	13 2	18 10	8 3	3 6	2 4	2 1	6 3	2 10	8 4
1944–45	—	—	—	10 4	3 9	2 6	3 9	7 3	3 3	8 6
1946—										
January	31 9	14 4	14 11	10 4	3 0	3 5	3 4	8 7	2 9	9 3
February	54 3	12 0	13 8	8 4	2 9	2 8	4 0	8 5	4 6	9 7
March	69 7	17 3	28 6	9 10	5 9	3 0	3 8	7 1	6 7	11 6
April	75 5	29 5	17 7	11 8	5 7	4 0	5 4	9 5	2 7	9 4
May	76 8	29 8	22 2	7 6	4 6	3 4	3 6	8 3	3 10	8 7
June	77 11	23 5	26 7	10 7	5 0	4 7	4 7	7 5	6 3	12 3
July	60 11	25 4	25 8	15 7	3 2	9 3	10 3	15 5	5 7	13 5
August	72 1	23 9	31 5	19 10	4 10	7 11	9 7	16 10	4 7	13 10
September	66 5	20 6	30 8	10 1	7 7	6 5	7 2	12 2	4 7	13 11
October	78 10	28 6	34 6	15 5	6 5	6 9	6 5	13 10	4 3	14 5
November	63 8	47 10	32 4	14 10	8 11	6 3	5 4	13 10	4 6	15 11
December	67 7	30 7	35 4	16 5	4 5	7 0	—	11 11	4 7	17 8
1947—										
January	41 7	20 2	20 4	9 2	5 1	2 3	3 6	6 8	3 6	7 5
February	46 0	14 10	15 10	6 10	2 0	2 0	2 7	5 4	3 7	6 8
March	47 5	18 4	22 10	9 3	—	3 6	—	8 3	5 2	11 8

(a) Season 1 January to 31 December.
(b) Season 1 October to 30 September.

Average Prices of Onions and Sweet Potatoes on Municipal Markets.

SEASON (1 July to 30 June).	ONIONS (120 lb.).						Sweet Potatoes. (120 lb.).		
	Johannesburg. Transvaal.	Johannesburg. Cape.	Cape Town. Cape.	Pretoria. Cape.	Durban. Local.	Durban. Cape.	Johannesburg. Table.	Durban.	Cape Town.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	8 3	8 10	7 4	7 10	8 6	9 6	5 7	4 8	5 3
1939–40	6 3	9 10	7 3	9 11	9 8	10 5	5 7	5 9	5 0
1940–41	12 5	12 3	9 10	11 11	11 2	12 7	7 3	6 4	5 5
1941–42	10 5	13 11	10 4	13 10	13 0	14 3	9 10	7 1	8 4
1942–43	13 8	14 0	12 6	14 7	12 9	14 5	9 8	8 1	8 5
1943–44	16 2	18 9	15 1	17 4	19 1	19 2	12 0	10 9	10 7
1944–45	14 7	18 7	14 8	18 1	18 8	19 5	17 3	15 1	16 3
1945—									
January	12 9	13 1	9 11	14 8	12 3	13 5	18 2	7 8	14 7
February	13 5	13 10	9 9	10 4	12 2	14 0	16 0	8 1	10 8
March	13 10	15 2	11 4	14 9	18 9	17 0	12 6	9 6	12 5
April	17 8	17 5	14 6	16 9	12 6	17 8	9 11	7 5	9 1
May	16 4	17 11	12 0	18 0	19 11	20 10	10 4	7 1	11 4
June	20 3	17 11	14 4	18 4	15 4	18 1	9 4	8 2	9 4
July	16 7	18 7	15 5	16 8	17 7	20 5	10 4	8 8	12 4
August	18 7	18 4	15 7	18 3	16 9	19 4	11 3	8 9	12 1
September	16 1	17 7	16 1	19 11	19 3	20 5	15 0	12 11	14 2
October	10 8	14 5	12 11	14 8	10 4	15 10	19 0	15 6	17 0
November	12 3	9 3	13 0	—	14 3	13 10	19 11	19 1	21 3
December	14 8	15 3	15 6	17 10	16 11	15 7	17 1	14 6	17 7
1946—									
January	12 0	12 1	9 7	—	11 7	13 0	17 1	15 6	17 3
February	12 3	13 8	11 1	13 1	15 2	9 11	17 3	10 3	17 2
March	11 4	12 4	9 9	12 10	12 9	13 5	18 5	14 8	14 8
April	12 1	12 10	11 3	13 10	15 1	14 9	15 2	17 4	14 7
May	13 6	13 9	11 9	13 9	12 10	14 7	15 8	15 6	14 5
June	14 7	15 5	12 2	17 1	15 11	14 11	14 11	14 8	15 1
July	11 10	14 3	12 0	15 0	15 2	15 6	15 2	15 2	17 4
August	14 9	17 0	13 7	15 10	20 6	18 7	16 10	16 0	18 3
September	20 9	25 3	20 4	23 2	21 5	23 3	20 0	16 5	22 11
October	24 9	28 1	32 5	24 0	32 3	31 8	24 6	16 9	20 10
November	21 11	—	26 11	—	24 8	21 1	23 10	15 1	20 8
December	16 8	15 2	12 4	—	19 8	19 6	18 11	11 11	25 5
1947—									
January	14 9	14 0	11 5	14 10	15 6	14 3	16 6	9 6	19 8
February	14 8	14 5	11 9	13 7	16 1	17 8	16 11	7 6	18 11
March	17 6	18 7	14 3	20 3	13 4	17 6	15 6	13 4	16 1

Index of Prices of Field Crops and Animal Products.

(Basic period 1936-37 to 1938-39=100.)

SEASON (1 July to 30 June).	Summer cereals. (a)	Winter cereals. (b)	Hay. (c)	Other field crops. (d)	Pastoral products. (e)	Dairy products. (f)	Slaughter stock. (g)	Poultry and poultry products. (h)	Combined index.
WEIGHTS.	19	13	2	3	34	6	17	6	100
1938-39	92	109	96	89	79	102	106	94	93
1939-40	86	114	77	95	115	105	106	89	104
1940-41	108	120	106	156	102	108	110	103	109
1941-42	120	144	143	203	102	131	135	136	124
1942-43	160	157	144	159	122	147	168	167	147
1943-44	170	186	137	212	122	154	185	188	159
1944-45	183	186	160	281	122	177	179	184	164
1945-46	201	194	164	312	118	198	185	170	170
1946—									
January	198	194	191	347	118	204	188	204	174
February	198	194	158	305	118	186	184	224	171
March	198	194	160	280	118	186	181	241	171
April	198	194	176	298	118	186	180	279	174
May	249	194	170	284	119	186	177	289	184
June	246	194	178	287	119	218	178	260	184
July	245	194	182	303	120	231	183	193	182
August	242	194	181	319	120	231	188	164	181
September	243	194	183	351	163	231	196	156	198
October	240	194	166	365	171	231	204	155	201
November	240	210	165	309	179	194	208	171	204
December	242	210	157	236	168	194	208	201	200
1947—									
January	242	210	144	174	178	194	200	238	202
February	240	210	127	157	187	194	191	248	203
March	240	210	154	158	189	194	182	251	203

(a) Maize and kaffircorn.
(b) Wheat, oats and rye.
(c) Lucerne and teff hay.
(d) Potatoes, sweet potatoes, onions and dried beans.
(e) Wool, mohair, hides and skins.
(f) Butterfat, cheese milk and condensing milk.
(g) Cattle, sheep and pigs.
(h) Fowls, turkeys and eggs.

Average Prices of Cabbages, Cauliflower and Tomatoes on Municipal Markets.

SEASON (1 July to 30 June).	CABBAGES (Bag). (a)			CAULIFLOWER (Bag). (a)			TOMATOES (Trays 15 lb.).			
							Johannesburg.			
	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban.	N.M. No. 1.	Other.	Cape Town.	Durban.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	3 10	3 0	3 10	3 0	1 8	3 5	2 2	1 3	1 8	0 10
1940-41	5 10	4 8	7 1	3 11	4 3	5 3	2 7	1 6	2 1	1 2
1941-42	8 10	5 5	11 5	5 9	5 7	7 11	3 1	1 9	2 3	1 6
1942-43	5 6	5 11	9 1	5 0	5 9	7 6	3 4	1 10	2 1	2 7
1943-44	11 1	7 4	17 6	9 2	6 2	12 1	5 5	2 9	3 7	2 0
1944-45	9 7	6 11	13 5	7 5	6 6	9 8	4 1	2 0	2 10	1 9
1945-46	10 1	7 1	10 11	8 4	6 5	11 1	4 11	2 4	3 4	1 7
1946—										
January	9 7	8 0	14 8	14 5	9 0	—	4 3	1 10	2 5	1 3
February	7 3	9 1	18 1	10 10	6 6	—	4 2	1 7	1 11	1 3
March	8 11	7 3	14 4	7 2	9 8	3 4	6 2	3 8	2 6	1 6
April	9 10	5 8	9 0	6 7	15 4	12 4	8 1	3 6	2 8	2 0
May	8 4	3 4	7 7	7 2	5 3	8 11	6 3	2 11	3 8	2 3
June	5 10	2 4	11 0	7 7	3 1	12 1	4 2	2 0	2 10	1 5
July	7 11	1 10	9 9	8 6	—	11 3	2 2	1 1	2 3	1 0
August	5 3	2 1	7 1	8 9	3 2	11 1	2 5	1 3	1 11	0 9
September	4 11	2 5	5 8	9 6	4 0	13 7	3 2	1 9	2 2	1 1
October	5 6	8 0	7 0	15 10	13 7	12 0	4 5	1 9	2 8	0 11
November	5 7	11 5	12 0	13 4	15 1	—	5 2	2 1	3 4	1 1
December	8 9	9 11	11 11	11 10	—	—	4 8	1 11	3 0	1 10
1947—										
January	9 0	12 3	5 9	11 3	23 8	—	5 0	2 0	2 11	1 6
February	11 4	14 10	14 3	12 5	15 2	—	5 6	2 3	3 4	3 1
March	12 0	17 2	17 6	12 1	16 6	31 5	7 10	3 9	4 0	2 11

(a) Weights of bags vary, but on the average are approximately as follows: For cabbages—Johannesburg, 150 lb.; Cape Town, 105 lb.; and Durban, 90 lb. For cauliflower—Johannesburg, 100 lb.; Cape Town, 65 lb. and Durban, 85 lb.

Average Prices of Green Beans, Green Peas and Carrots on Municipal Markets.

Season (1 July to 30 June.)	Green Beans (Pocket 20 lb.).			Green Peas (Pocket 20 lb.).			Carrots (Bag). (a)		
	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban.	Johannesburg.	Cape Town.	Durban
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39.......	1 8	2 3	2 0	2 4	1 9	1 2	3 8	2 6	6 1
1940-41.......	1 11	2 9	1 5	2 8	2 4	2 3	5 9	4 11	13 4
1941-42.......	2 7	3 10	2 6	3 11	3 3	3 4	8 5	8 11	17 2
1942-43.......	3 1	4 3	3 0	3 3	2 10	3 9	5 1	8 9	13 2
1943-44.......	3 8	4 11	3 0	4 11	4 10	4 11	9 11	11 1	20 2
1944-45.......	3 7	5 1	4 1	4 9	4 1	5 5	8 3	9 11	19 10
1945-46.......	3 4	4 7	3 6	5 11	7 2	6 1	8 10	11 4	17 1
1946—									
January.......	3 4	1 11	5 6	8 8	10 11	14 7	9 8	6 2	16 0
February......	1 11	—	2 3	6 5	—	6 4	7 3	7 11	14 1
March.........	2 10	1 1	2 5	6 1	—	3 4	8 10	8 1	23 10
April.........	2 7	3 4	3 1	5 7	—	4 10	10 2	9 3	24 2
May...........	1 9	3 0	2 2	7 2	3 10	5 10	7 1	6 3	18 8
June..........	1 10	2 0	2 8	4 8	4 1	5 7	4 2	7 6	11 7
July..........	3 2	1 11	2 2	2 7	3 6	3 4	3 8	4 8	7 10
August........	6 3	4 2	6 6	5 10	5 0	4 9	4 5	3 8	11 0
September.....	6 6	7 5	6 4	5 0	4 11	5 1	3 8	3 2	10 11
October.......	5 0	5 0	5 2	3 3	3 6	5 7	4 7	4 1	9 7
November.....	2 11	2 7	1 11	6 5	3 10	9 5	6 3	3 7	11 5
December......	3 9	2 8	2 5	9 0	—	7 0	7 6	5 4	19 5
1947—									
January.......	3 0	—	3 5	4 0	8 7	4 9	7 7	—	16 5
February......	4 2	—	5 1	3 2	12 2	5 8	10 4	—	12 8
March.........	3 5	—	2 8	5 3	10 5	7 5	16 8	20 0	24 5

(a) Weights of bags vary, but on the average are approximately as follows:—Johannesburg, 130 lb. ; Cape Town, 90 lb.; and Durban, 120 lb.

Average Prices of Lucerne, Teff, Kaffircorn and Dry Beans.

Season and Month (b).	Lucerne (per 100 lb.).			Teff Johannesburg (a) 100 lb.	Kaffircorn in bags (200 lb.).		Dry Beans (200 lb.) bags.		
	Johannesburg (a).		Cape Town 1st grade.		F.o.r. producers' stations.		Johannesburg (a).		
	Cape.	Transvaal.			K1.	K2.	Speckled Sugar.	Cow-peas.	Kidney.
	s. d.	s. d.	s. d.	s. d.	s. d.	s d.	s. d.	s d.	s. d.
1938-39.......	3 10	3 1	4 0	2 7	13 1	12 9	25 0	16 9	24 2
1939-40.......	3 0	2 5	3 4	2 6	8 8	9 4	21 11	13 11	21 2
1940-41.......	4 2	3 5	4 3	3 3	15 6	17 0	30 0	16 8	27 11
1941-42.......	5 7	5 2	5 8	4 7	18 10	19 6	32 10	19 8	23 3
1942-43.......	5 5	6 0	7 4	5 5	24 10	24 10	34 0	25 8	24 2
1943-44.......	5 4	5 6	7 3	4 5	21 0	21 7	49 6	29 11	32 1
1944-45.......	6 4	5 4	7 2	4 9	18 8	18 8	88 7	39 6	70 6
1946—									
January.......	7 6	—	8 1	5 9	20 6	20 6	103 4	68 6	75 4
February......	6 0	5 10	8 1	5 9	20 6	20 6	90 8	69 3	69 4
March.........	6 2	5 3	7 4	5 4	20 6	20 6	86 8	61 11	63 7
April.........	7 0	5 6	7 4	4 11	20 6	20 6	91 4	51 0	74 3
May	6 10	5 1	7 6	4 6	69 11	69 11	90 6	52 11	75 7
June..........	7 3	5 6	7 6	4 5	60 8	60 8	84 2	45 9	66 1
July..........	7 5	6 9	7 3	4 5	57 10	57 10	81 8	45 1	67 7
August........	7 5	4 8	7 3	4 3	48 5	48 5	69 11	41 1	61 7
September.....	7 6	7 0	7 3	4 4	50 0	50 0	73 0	40 4	61 11
October.......	6 9	4 11	6 9	4 1	40 3	40 3	69 2	34 5	56 6
November.....	6 9	5 10	7 2	3 11	40 10	40 10	61 4	35 3	59 10
December......	6 3	5 6	7 3	4 5	48 8	48 8	70 2	36 6	52 11
1947—									
January.......	5 10	5 11	7 5	3 8	48 9	48 9	61 4	38 11	51 4
February......	5 0	4 10	7 5	3 11	40 11	40 11	44 3	33 6	44 3
March.........	6 3	5 10	7 5	3 11	40 8	40 8	47 1	35 1	49 3

(a) Municipal Market.
(b) Seasonal year for affircorn, 1 June–31 May. Dry Beans, 1 April–31 March; Lucerne and teff, 1 July–June.

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CONTENTS

(Cover: Loganberries).

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Information on Departmental Publications.

Farming in South Africa, the monthly journal of the Department, contains popular as as well as scientific articles on a variety of agricultural topics, useful to both the farmer and the housewife, while the **Crops and Markets** Section supplies information on crop prospects, market prices and exports of agricultural produce.

The following particulars in regard to subscriptions and advertisements should be noted :—

Subscription.—Within the Union, South West Africa, Bechuanaland Protectorate, Southern Rhodesia, Swaziland, Basutoland, Mocambique, Angola, Belgian Congo, and British Territories in Africa, 5s. (otherwise 7s. 6d.) per annum, post free, payable in advance.

Applications, with subscriptions, to be sent to the Government Printer, Bosman Street, Pretoria.

Advertisements.—The Tariff for Classified Advertisements is: 2d. (two pence) a word with a minimum of 5s. per advertisement (prepaid). Repeats, not entailing any change in the wording, will be published at half the cost of the original.

Conditions:

(1) The advertisement will be classified under specific headings, and only one black letter (initial letter) is permitted.

(2) Advertisements in which prices are mentioned must contain the name and address of the advertiser. A nom-de-plume or box number only is not sufficient, and unless this condition is strictly observed, advertisements will not be accepted.

(3) Advertisements will be classified strictly in accordance with the subject-matter of the announcement, determined by the first item mentioned and cannot be inserted under irrelevant headings.

(4) Displayed, classified advertisements will also be accepted. The charge, however, will be 10s. per inch, single column, per insertion, without reduction for repeats.

Copy for Advertisements to be in the hands of the Government Printer, Pretoria, not later than the 20th of the month preceding publication.

Send all advertisements direct to the Government Printer, or write to him for details as to tariff for advertisements.

Popular Bulletins.—Bulletins on various agricultural topics are published by the Department to meet public demand. A list of available bulletins giving particulars of cost, etc., is obtainable free of charge from the Editor, Department of Agriculture, Pretoria.

Scientific Publications.—From time to time the different Divisions of the Department issue science bulletins incorporating the results of research work conducted by them. Other scientific publications issued are: "The Onderstepoort Journal", "Memoirs of the Botanical Survey of South Africa", "Bothalia", "Entomological Memoirs" and the "Annual Reports of the Low Temperature Research Institute". Information in regard to these publications is obtainable from the Editor, Department of Agriculture, Pretoria.

Press Service.—The Press of South Africa is now supplied with a bulletin of agricultural information for their exclusive use. This information is supplied to all newspapers and other journals throughout the country.

Farmer's Radio Service.—In addition to the printed information supplied by the Department to members of the farming community, the Department, in collaboration with the South African Broadcasting Corporation, also has a national broadcasting service for farmers. Information in regard to times of broadcasting is contained in the programmes issued by the Broadcasting Corporation.

Inquiries.—All general inquiries in regard to the above should be addressed to the Editor Department of Agriculture, Pretoria.

D. J. SEYMORE Editor.

FARMING IN SOUTH ... AFRICA

VOL. 22 June 1947 No. 255

Editorial:

Changed Economic Relationships in Farming.

South African agriculture has passed through three war periods during the past half century. After each war it has had to re-adapt itself to peace conditions and changed economic relationships. The Anglo-Boer War was followed by a sharp decline in agricultural prices which, together with the problem of capital reconstruction, caused a very difficult readjustment. An improvement in the price level occurred, however, round about 1908. Land was also, relatively speaking, still plentiful and cheap so that a shift to a new farm could still take place reasonably easily.

During World War I economic relationships in agriculture were very favourable, with the result that agricultural production greatly increased. A larger and larger area of the country came under productive use and our agriculture finally switched over onto a full commercial basis. The self-sufficient character of our agriculture which in some cases still partly survived from the previous century, disappeared permanently during the first World War.

As farming becomes more commercialized and concentrated on specialized production for the market, it also becomes more sensitive to changed relationships in the economic network. Proof of this lies in the difficult times our agriculture experienced during the twenties, but especially during the first half of the thirties. The declining trend in agricultural prices since about 1920 up to more or less 1934 brought about many malrelationships, especially between farm indebtedness, land values, prices of products sold by the farmer, and prices of requisites bought by the farmer and used in the agricultural production process. On a rising price level the relationships between these factors are to a large extent in the farmer's favour. This has been the case since 1940 and up to the present.

At the time of writing the price trends are still upward. There is as yet no indication of even a flattening out of the price curve, far less any indication of a downward movement. No one can state for how long these favourable relationships will last. Economic history teaches us, however, that every war inflationary period is followed by a declining price structure or deflationary period. No facts are available which may change our views as to the probability of a recurrence of a downward price trend during the present post-war period. We must therefore expect a declining price structure sooner or later. With the aid of our control measures the decline will not be as severe as it was after the first World War, but a decline cannot be prevented. A declining price structure brings about malrelationships which are unfavourable to the agricultural producer. The more commercialized a farm is, the more it feels the effect of a declining price structure.

During the past seven years practically all the available farming area was brought into productive use, with the result that there is no longer any chance of escaping to "new" areas. What we have we

must keep. The period of further expansion to new areas has gone for good. A further important change which has taken place is in regard to our farm labour factor. It is a well-known fact that our agriculture was developed from the start on the basis of abundant and cheap labour. This era of a cheap and abundant labour supply is evidently a thing of the past, or at least is rapidly passing away. This means that a definite changed relationship has set in between the production factors labour and capital goods such as machinery and implements, and our agriculture will have to adjust itself to it. This adjustment is already taking place and will continue to do so during the following decade.

What are we to do now, especially if a downward price trend were to set in? In the first instance an attempt should be made to lower the individual farm indebtedness as quickly as possible. On a downward price structure the greatest pressure is encountered from the indebtedness. Fixed annual payments for debt and interest will have to come out of a diminishing farm income. Under such conditions the farmer is usually forced to malpractices which are not to the advantage of coming generations.

In the second instance it should be realized that profit per unit of product is the difference between cost of production on one hand and price received on the other hand. Price is certainly not the only medicine to keep the profit positive, although for the farmer it is the most pleasant. The cost of production is equally important. Just as there are various factors affecting the cost in a factory or ordinary business, so there are factors affecting the cost of production in farming. Remember that a farm is to-day as much of a business as, and perhaps even more intricate than, a factory or ordinary business. Productivity, i.e. yield per morgen, per tree or per animal unit, is one of the most important factors which determine the cost of production on the farm. Maintaining soil fertility and improvement of the herd are therefore two of the most important keys to permanent financial success. This naturally requires the ideal utilization of our land, whether grazing or under cultivation. More extensive use should be made of all possible information, and facilities placed at the disposal of the farmer by the Department of Agriculture. There are still so many farmers who regard technical advice on agriculture as unnecessary. Such an attitude will also have to disappear sooner or later.

Thirdly, the changed labour factor brings about a greater use of machinery and implements, in other words a higher investment in machinery and therefore an increased cost of this item relative to the total farming costs. This does not mean that such a changed relationship between the costs of these two factors of production will increase the total farm costs. On the contrary, it ought to bring about a lowering of the total costs, or at least an increase in profit. But it may have the opposite effect should the choice and purchase of the machinery not be thoroughly investigated and studied beforehand. A few surplus labourers can easily be disposed of, but after a tractor or combine or lorry has been purchased it is not so easy to get rid of it again except at a loss. Each farm has its own requirements in respect of the machinery and implements to suit its size and type. The capital goods owned and used on a particular farm are not sufficient reason for all the surrounding farms to acquire exactly the same mechanical outfit. In many cases the size of the farm will have to be readjusted to the minimum labour-saving machinery outfit in order to get the most productive use of such mechanical unit. Further subdivision of a farm at this stage should first be considered seriously in the light of further mechanization. There

The Bitter-Seville Rootstock Problem.

Dr. P. C. J. Oberholzer, Department of Horticulture, Agricultural Research Institute, University of Pretoria.

The Bitter Seville, also known as sour-orange (*Citrus aurantium*), was, up to a few years ago, the most widely used rootstock for citrus fruits in many of the older and most productive citrus regions of the world like California, Florida, Spain and Italy. In other parts of the world, however, notably South Africa, Java and parts of India, experience had shown that this species is a complete failure when

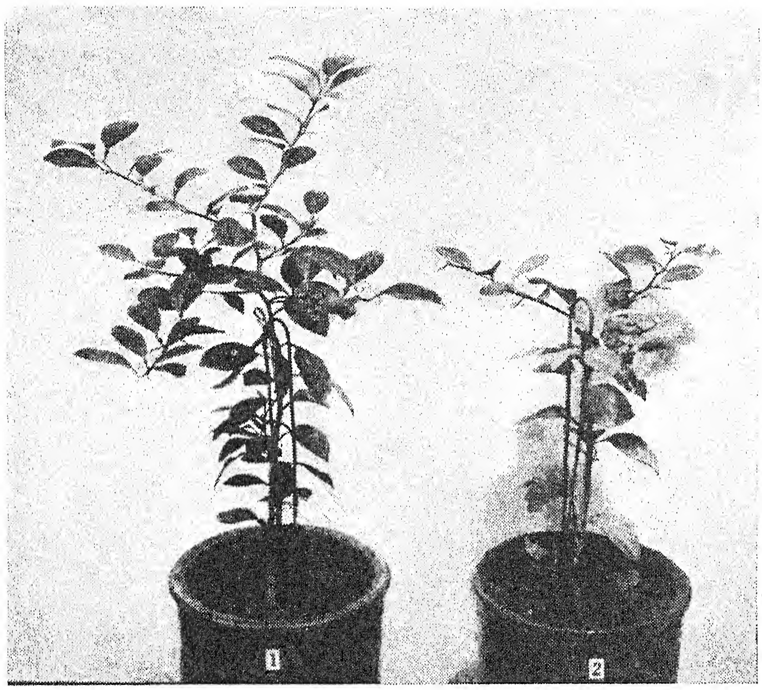

FIG. 1.—(1) Valencia orange (bud taken from a nucellar seedling) on Californian sour-orange rootstock. Rootstock two years and eight months from seed; scion approximately fourteen months after budding.
(2) Identical with (1), but two Valencia orange buds (taken from a normal budded orchard tree) were inserted on 11th December, 1946. Note cessation of new growth, chlorotic leaf symptoms and leaf fall.

budded to sweet orange, mandarin and other species, with the result that other rootstock types had to be found, e.g. the rough lemon in South Africa. Experience in this country has further indicated that the commercial lemon (*C. limon*), certain acid lime types, and to a certain extent also the grapefruit (*C. paradisi*), behave more or less similarly to the sour-orange when used as rootstocks. Finally, no difficulty is experienced in producing healthy, productive lemon trees on the sour-orange rootstock([2]).

This apparent anomaly, especially as far as the incompatibility reactions of the sour-orange rootstock are concerned, has attracted considerable attention from physiologists and horticulturists, but was regarded more in the light of an " interesting phenomenon of incompatibility " until approximately 1931, when it suddenly came into the limelight with the discovery that sweet oranges, grapefruit and

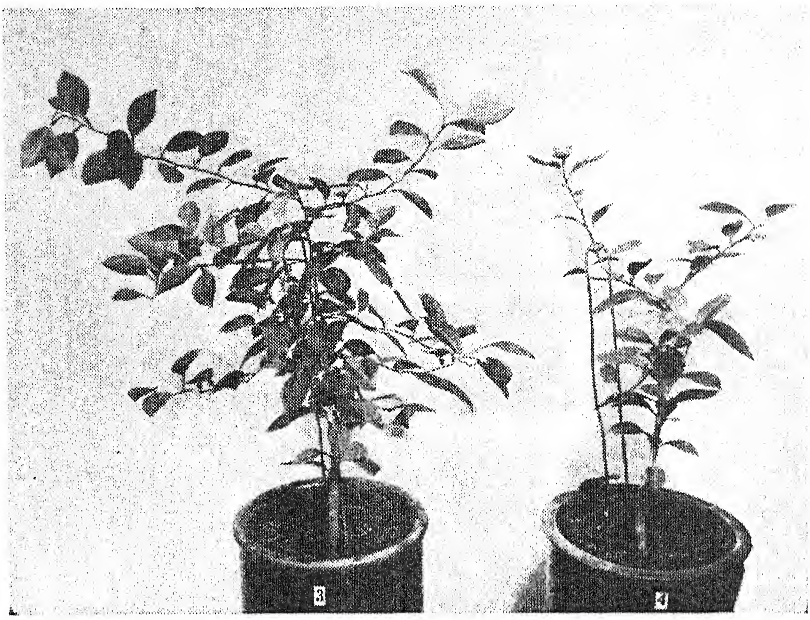

FIG. II.—(3) Valencia orange (bud taken from a nucellar seedling) on Eureka lemon rootstock. Rootstock two years and eight months from seed ; scion approximately fourteen months after budding.
(4). Identical with 3, but two Valencia orange buds (taken from a normal budded orchard tree) were inserted on 11th December, 1946. Note cessation of new growth and chlorotic leaf venation.

mandarins budded on sour-orange rootstock exhibited decline symptoms in parts of the Argentine, resulting in the death of many trees. A few years later, viz. in 1937, a peculiar " disease " termed " Tristeza " was reported from parts of Brazil, where, according to reports so far received, many millions of sweet-orange trees budded on the sour-orange rootstock have been completely destroyed. More recently, i.e. during the early part of 1944, it was reported from California that a somewhat similar " disease ", now termed " Quick-Decline ", was taking a fairly heavy toll of sweet-orange trees budded on the sour-orange in certain districts. Since recent reports([1]) from California indicate that " Quick Decline " is probably caused by a virus, it may be of interest to report briefly on results obtained by the writer in studies pertaining to the peculiar behaviour of the sour-orange and other citrus species when used in certain stock-scion combinations. It is hoped to publish at a later date a detailed report on all the investigational work which was commenced during 1937. This article therefore deals mainly with the results of experiments conducted in Pretoria during the past few years.

In view of the persistent failure to obtain normal growth of certain stock-scion combinations of citrus (e.g. sweet-orange on sour-orange rootstock) in soil, sand and solution cultures, the author

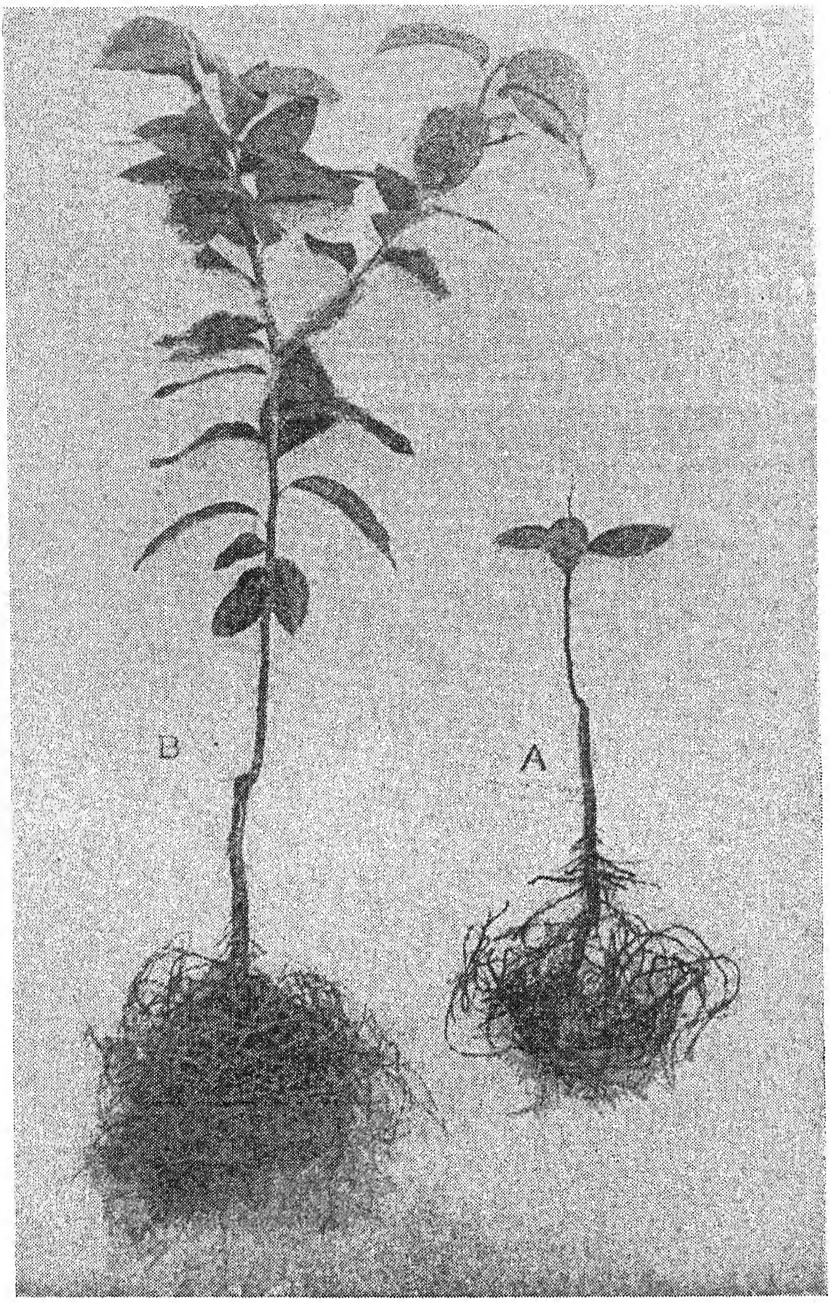

FIG. III.—(A) Valencia orange (bud taken from a normal budded orchard tree) on Californian sour-orange rootstock which was grown in complete nutrient solution (aerated water-culture) one year prior to budding. Rootstock approximately two years from seed; scion approximately one year after budding. Note poor scion growth and extensive decay of fibrous root-system.

(B) Eureka lemon (bud taken from a normal budded orchard tree) on Californian sour-orange rootstock grown under similar conditions as described under (A). Note healthy scion and root growth.

concluded, partly as a result of the suggestions made by Bitancourt and later by Webber([3]), that the problem of "incompatibility" may be of a pathological, rather than nutritional, nature. The possibility of a virus being the causal agent received the first attention, and in this connection the following basic principles were applied in the experimental procedure, viz.:—

I. A particular virus, although "systemic" throughout the tissues of the host plant, is, *as a general rule*, not readily transmitted by the seed.

II. In view of the well-established principle of "nucellar embryony" characteristic of the genus *Citrus*, it is possible, by means of seed propagation, to maintain the inherent genetic constitution of a particular variety simply by eliminating the "sexual variant" by relatively simple and well-known methods. By combining these two fundamental principles, it becomes possible to obtain rootstock and scion material free of a particular virus, and hence to obtain, theoretically at least, normal growth of so-called incompatible combinations, i.e. if a virus should be the underlying cause of incompatibility. (As far as the writer is aware, the value and importance attached to the phenomenon of "nucellar embryony", characteristic of the genus *Citrus*, have thus far been confined almost exclusively to the question of rootstock selection. The possibility of applying this principle also to the scion-variety, especially as regards the elimination of virus diseases, has apparently been entirely overlooked.) The results of carefully planned experiments conducted in the glass-house, where plants have been kept reasonably free from insects (except the occasional appearance of red spider), confirm this hypothesis, and are briefly as follows:—

(*a*) Healthy, vigorously-growing Valencia scions on sour-orange, lemon and grapefruit rootstocks, as well as Triumph grapefruit scions on sour-orange and lemon rootstocks, have been obtained by taking budwood from nucellar seedlings of the particular scion-variety [see figures I(1) and II(3)]. (All these combinations have proved to be more or less incompatible under ordinary nursery conditions.) Most of these budded trees are already over one year old and, besides being exceptionally vigorous, exhibit no signs whatever of disease. If budwood be taken from orchard-trees of the same scion-varieties, the young budlings exhibit extensive root decay, chlorosis and general decline at a very early age (generally 1 to 3 months after budding), and result in straggly, miserable, diseased plants [see figures III(A) and V(D)].

(*b*) Healthy plants obtained under (*a*) can be induced to stop all new growth, followed soon afterwards by chlorotic leaf symptoms and almost complete destruction of the entire fibrous root system simply by inserting buds of the respective scion variety, taken from apparently healthy budded trees in the orchard, into the rootstock or scion. [See figures I(2) and II(4).] The symptoms of decline associated with such treatment are fairly similar to those ordinarily obtained in the nursery, i.e. when buds are taken directly from an orchard tree and inserted into the particular rootstock.

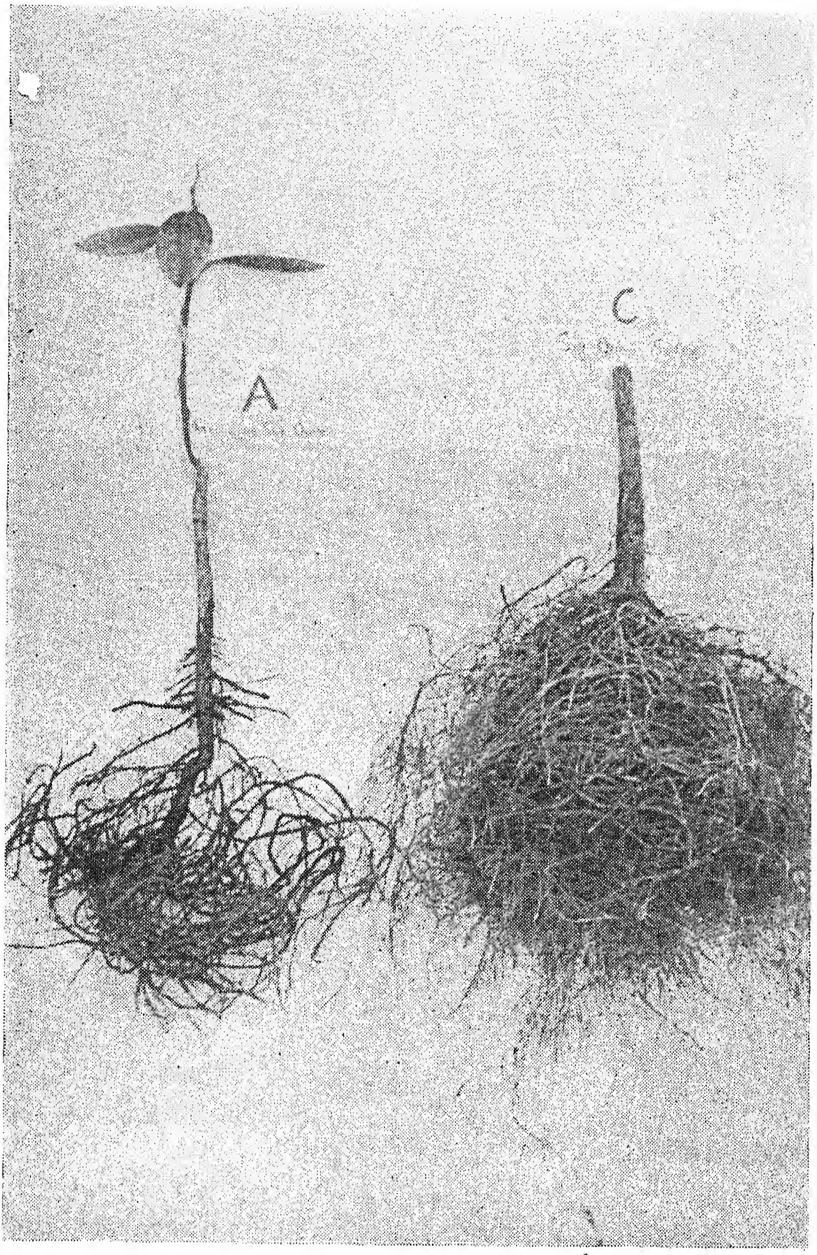

FIG. IV.—(A) Valencia orange (bud taken from a normal budded orchard tree) on Californian sour-orange rootstock which was grown in complete nutrient solution (aerated water-culture) one year prior to budding. Rootstock approximately two years from seed; scion approximately one year after budding. Note poor scion growth and extensive decay of fibrous root-system.

(C) Unbudded Californian sour-orange seedling grown under conditions similar to those described under (A). Note large, healthy root system (top removed when photographed).

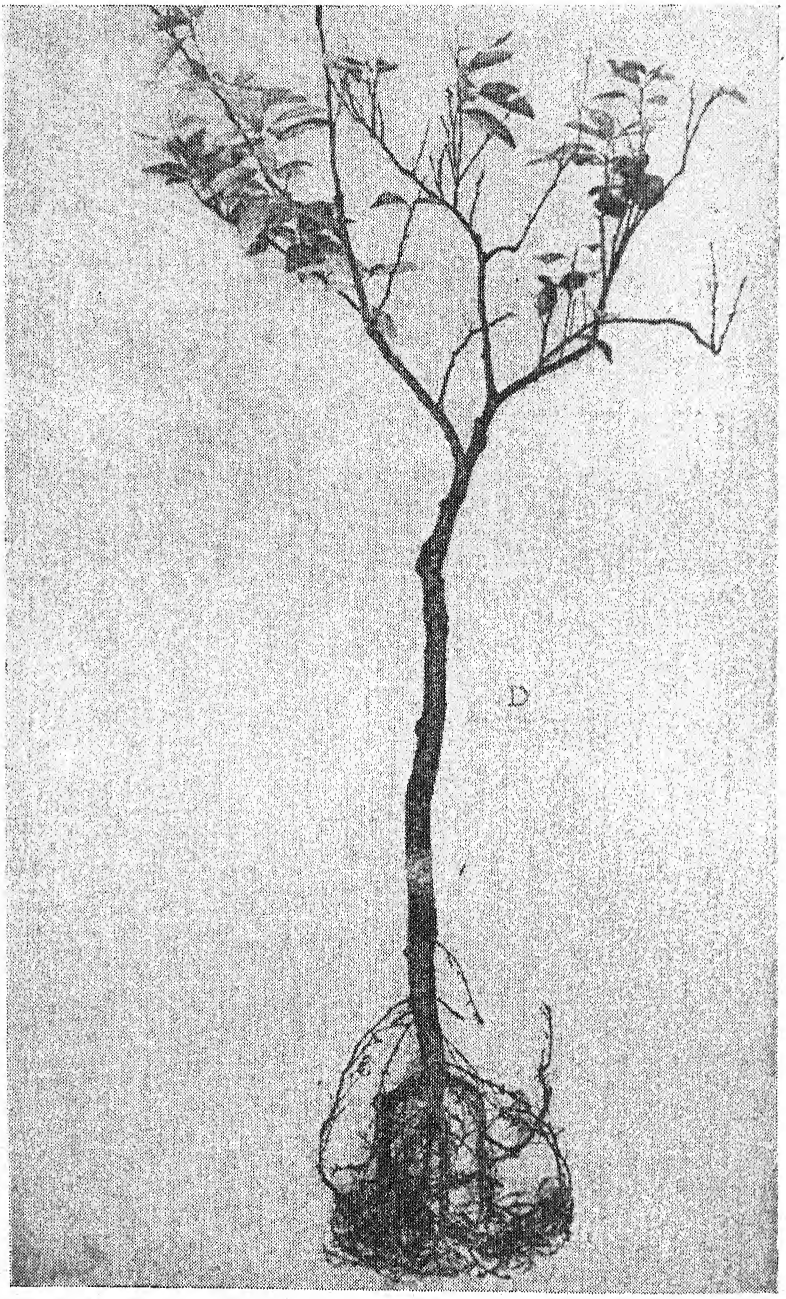

FIG. V.—(D) Valencia orange on Californian sour-orange rootstock transplanted from the nursery and kept "alive" in aerated water-culture for approximately five years. Age of rootstock approximately eight years; age of scion approximately six years. Note poor topgrowth and lack of healthy fibrous roots. [Photographs 1, 2, 3 and 4 by E. King, courtesy Dr. A. P. D. McClean (April 1947); A, B, C, and D originally by Prof. M. G. Mes. University of Pretoria (May, 1946), and enlarged by E. King, courtesy Dr. A. P. D. McClean, Division of Botany and Plant Pathology. Dept. of Agriculture].

Conclusions.

While it is realized that further evidence is needed before final conclusions can be drawn, the results obtained nevertheless prompt one to suggest the following tentative hypothesis:—

1. The incompatibility reactions exhibited by certain stock-scion combinations of citrus in South Africa are probably caused by a virus, which is present in a latent form in certain species or varieties (e.g. Valencia orange), and only causes pathological conditions when certain stock-scion combinations are made.

2. Preliminary results indicate that such a virus is satisfactorily (if only temporarily) eliminated by taking the infected, but apparently healthy, scion variety through the seed, making use of the well-established principle of "nucellar embryony" characteristic of the genus *Citrus*. By using buds from such nucellar seedlings, healthy and exceptionally vigorous budlings have been produced of hitherto incompatible combinations, e.g. Valencia orange on sour-orange and lemon rootstocks. Provided infection does not take place mechanically, or by means of an insect vector, such plants will probably continue to make healthy growth.

3. The insertion of buds of the particular scion-variety (e.g. Valencia orange), taken from a normal budded orchard tree, into such healthy budlings causes infection within a relatively short time, resulting in the typical symptoms of decline, root decay, etc. This tends to indicate that the virus is readily transmitted by budding.

4. Finally it would appear, from experience and general information available, that the incompatibility reactions found in South Africa, Java and parts of India, especially as far as the sour-orange is concerned, probably bear a direct relation to the problems of "Trísteza" and "Quick Decline", and that the underlying cause in each case is probably a virus. Furthermore, experience in South Africa and elsewhere strongly suggests that this virus is infectious, being distributed by other means as well as by budding.

ACKNOWLEDGMENT.—The writer is indebted to Dr. J. D. J. Hofmeyr of the Department of Genetics, Agricultural Research Institute, for his continued interest in this work, and for many helpful criticisms and suggestions. His views regarding the dangers of accumulation of degenerative diseases as a result of continued vegetative propagation of horticultural plants have had an important bearing on the whole trend of thought pertaining to the investigational work reported on in this article. Appreciation is also expressed to Professor B. J. Dippenaar, Dept. of Plant Pathology, Agric. Res. Institute, for his encouragement, as well as for the benefits derived from personal discussions regarding the seed-transmission of virus diseases.

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Groundnut Seed.

THE demand for oil-bearing seeds has created considerable interest in the availability of groundnut seed. Consequently, the Department of Agriculture, the Directorate of Food Supplies and Distribution, co-operative societies, seed merchants and producers are receiving numerous inquiries regarding the immediate delivery and reservation of seed. However commendable the practice of making early provision for seed may be, it should be pointed out that it is inadvisable to supply groundnut seed until about September. The agents of the Directorate of Food Supplies have to take delivery of a groundnut crop twice as large as any hitherto grown in the Union. The greater part of the supplies that are in excess of our seed requirements must be shelled and delivered to the oil factories which are short of groundnuts. Only when a large portion of this material has been despatched, can sufficient attention be devoted to the shelling, preparation and selecting of seed.

Groundnuts should not be planted until the danger of frost is over. Even in frost-free areas planting may well be delayed until September. Experience and investigations have shown that in general groundnut seed should not be shelled too long in advance of planting time, unless it is kept under cool conditions.

As was the case last year, provision is again being made for the reservation of an ample supply of groundnut seed. The conditions under which the seed will be obtainable, and from whom, as well as particulars regarding prices, quantities, sizes and varieties available, the need for permits and whether seed loan schemes will again be in operation, will be announced in the press towards September next. Recent references in the press to a groundnut seed loan scheme referred to that in force in certain districts from September to December 1946. To facilitate seed distribution in general, regular groundnut growers would do well to reserve their seed requirements from their own stocks.

As important as the seed itsel[illegible] need for treating it with a suitable seed protectant. Seed [illegible]ts are advertised in the agricultural press throughout the [illegible]ew of the fact that most of our soils are well supplied [illegible]dnut plant root-nodule bacteria, the inoculation of this [illegible]ule, not recommended. Moreover, protectants and inocu[illegible] used on the same seed. As far as possible, seed protect[illegible]plied very thoroughly, and preferably by means of [illegible] or other mechanical apparatus. D.D.T. is not a [illegible]uld therefore not be used as a seed protectant on [illegible]

(Depart[illegible]

The Influence of the Milker on Milk Production.

C. P. Greyling, Lecturer in Dairying, Grootfontein College of Agriculture, Middelburg, Cape Province.

THERE are about twenty different known important factors affecting the quantity or the chemical composition of milk. It is up to the farmer to feed his cows on an adequate and balanced ration, but apart from this, there is not much he can do to control most of these factors. One factor, however, which can be controlled and in respect of which there is room for improvement in South Africa is impairment of the milk by the milker; who by being indifferent to his cows, ill-treating them or applying wrong methods of milking, may cause the cow to withold her milk, and thus yield less. Such small quantities of milk as are produced in these circumstances are usually low in milk fat. The last few draws from the udder very easily contain as much as or even more than 10 per cent. milk fat, and it is precisely this milk which is often left by too hurried milkers, who draw the fore-milk only.

It often happens that milk is drawn by milkers who are in an inebriate condition or who are lazy or in a hurry and at such times the udders are not properly emptied. In such circumstances less milk and milk with a lower fat content is obtained. These factors all conduce to financial loss to the farmer, because of the lower butterfat content. The butterfat content of milk or cream to-day usually constitutes the basis on which the price of milk or cream is fixed in South Africa.

In order to control this adverse influence of the milker, it is desirable that the milking of a certain group of cows should be assigned to one milker. This system would serve a double purpose: the cows would grow accustomed to the milker and at the same time a better check could be kept on the milker himself. If, for instance, through being in a hurry, he drew very little milk, it would immediately be noticed. Even in those cases where milking-machines are used, it is desirable that the same person should always attach the instrument to the same cow and, if necessary, perform the final milking.

Another respect in which the milker plays an important rôle is the contamination of milk, particularly with disease germs. A study of the statistics on typhoid epidemics will reveal that most of these epidemics are due to the ingestion of contaminated milk and that contamination is usually caused by a so-called carrier of typhoid who at some time or other has handled the milk. About four per cent. of recoveries remain carriers of the disease and may spread the disease on a large scale. There are various ways in which a milker is likely to contaminate the milk. Germs may be carried by the hands, the mouth, nose or throat. Old clothes, too, are a possible source of infection. Germs land in milk when the milker talks, coughs, sneezes or whistles over the milk in the pail into which it is being drawn, or over milk standing uncovered. Germs from these sources are often pathogenes and may cause a septic throat or some other disease in persons drinking the milk. In the milk byre, talking should be limited to a minimum and where the milker cannot avoid sneezing, talking and coughing, he should turn his face away from the milking pail or any milk standing uncovered.

Milk should never come into contact with the hands of the milker, for if it does, it will tend to wash off dirt and germs into the pail. Before starting to milk, the milker should wash his hands thoroughly and also his forearm to above his elbow. Washing the hands alone, is not sufficient, since the forearm continually moves over the pail, and germs as well as dirt are liable to drop into the milk. It is from the hands or forearms that the germs of typhoid usually find their way into the milk.

Furthermore, every time before milking a fresh cow, the milker should wash his hands with soap, as the latter is an antiseptic. A damp, dirty towel affords a good breeding place for germs and if the hands are wiped with such a cloth, millions of germs are conveyed to the hands and may find their way into the milk. If no clean towel is available, rather do not use one at all.

Where cows are milked dry, a cheap, good vaseline should be used for smearing the teats. The vaseline should not impart any taint to the milk and should be kept in a clean spot so as to obviate the accumulation of dust, dung and other dirt in it. The dirty habit displayed by some milkers of dipping their fingers in the milk for wetting the teats, should be avoided at all costs. In order to prevent contamination from clothes it is desirable to keep special white overalls for milkers. These overalls should be kept neat and taken off immediately after milking.

The following are a few of the most important diseases the germs of which may be conveyed from the milker or person handling the milk, through the milk: Typhoid, dysentry, septic throat and food poisoning. The germs of all these diseases, and also others which do not produce disease but are, nevertheless, harmful as regards the keeping quality of milk or products manufactured from milk, are capable of multiplying in the milk to a greater or lesser extent and of thus rendering it unsuitable for human consumption.

Changed Economic Relationships in Farming :—

[*Continued from page* 488.

already exists a large percentage of uneconomic farm units, too small to make the most efficient use of their " mechanical unit ". In such cases the cost of production is automatically higher than on farms of a more economic size.

The change that has taken place in the labour factor of production, namely shortage of labour and higher wages, also brings about the necessity of improved farm lay-out in South African agriculture, a problem which has hitherto received relatively little attention. The situation of the farmstead in relation to the whole farm and also the relation to each other of the various buildings on the farm leave much to be desired on many of our farms. Every year hundreds of miles are walked unnecessarily on many farms because of a poor lay-out and uneconomic arrangement of buildings. Such unproductive use of the labour force does little economic damage when labour is plentiful and cheap, but the picture is altogether different when labour becomes scarce and high priced, as will be the case in future and is to a large extent already at present.

Finally just this: Circumstances will demand from farmers in future a greater technical and economic knowledge of farming. If at all possible, the son who is to take over the farm, should be sent to an agricultural college or university in order to equip himself properly for the task that lies before him.

(Dr. F. R. Tomlinson, Agricultural Research Institute, Pretoria.)

Fibre-Yielding Wild Stock Rose.

Miss I. C. Verdoorn and D. G. Collett, Division of Botany and Plant Pathology.

THE "wild stock rose" has attracted considerable attention recently as being the most promising of the indigenous fibre-yielding plants. Farmers have naturally become interested in the species and may find the following description and plates useful in enabling them to identify it.

The plant is an erect *annual* about 5 to 12 ft. tall.

Main stem rigid, erect, with or without lateral branches which are usually shorter than the main stem; main stem and branches prickly with short sharp points which are often red.

Leaves rather distant on the stem with stalks up to 8 cm. long and spreading stiffly at right angles from the stem, blades deeply palmately 5 to 7-lobed (sometimes with more or fewer lobes); lobes up to about 8 cm. long and 2 cm. broad with the margins coarsely serrate and a gland at the base of the middle lobe, glabrous or with a few inconspicuous hairs on the nerves below, leaf stalk with a few prickles and minute hairs.

Flowers borne in the axils of the leaves in the upper portion of the stems and branches (flowering portion becomes up to several feet long), developing from below upwards so that on top is the youngest bud, a little way down an open flower (usually only one open at a time), and below it the developing fruit, the corolla having fallen. *Flowerstalk* very short, up to 1 cm. long, rather stout and prickly. *Involucel* at base of flower like a frill of (usually) 7 green, narrow-pointed, spreading lobes, dorsally hairy with broad-based diaphanous hairs and in the young stage sometimes also woolly. *Calyx* 5-lobed, lobes ovate-acuminate, enclosing the bud, appressed to the base of the corolla in the open flower, and closing over the fruit after the corolla falls, usually with red raised dots (the thickened bases of the hairs) below and along the margins, and having a thick green keel with a gland about half way up the lobe. *Corolla* with 5 obovate, crinkly lobes about 4·5 cm. long ($1\frac{3}{4}$ inches), pale sulphur-yellow with a deep crimson patch at base inside shading into a dark, deep bluish violet. *Stamens* united into a column, purplish crimson; pollen dull yellow. *Ovary* globose, pointed, bristly with appressed hairs, 5-celled with many ovules in each cell.

Seeds sub-glabrous, bluntly pointed at the base, broadly rounded at the top with 3 to 5 flattened sides.

Distribution.

The common name "wild stock rose" is to-day very generally applied to *Hibiscus cannabinus* and a closely related species which is most probably *Hibiscus diversifolius*. Both these species occur in the Transvaal and Natal. *Hibiscus cannabinus* is also known as Deccan hemp, Ambari hemp, Gambo hemp, Bimlipatum jute and wild hollyhock. It is a well-known fibre plant of India and, as well as occurring in the Transvaal and Natal, may be found in Bechuanaland and South-West Africa, extending northwards into Central Africa.

Over its wide range of distribution the species naturally varies in some respects such as size of plant and colour of flowers, but in general it is characterized by the tall, rigid main stem and very short rigid flower-stalk, by the hard, sharp prickles on the stems, branches and stalks, the hard red, raised dots on the calyx, the rather long stalk of the leaf standing out stiffly from the stem, and the leaves which are palmately lobed almost to the base. It might be mentioned that the lowest and uppermost leaves are generally entire, the former orbicular, the latter linear-lanceolate in shape.

The other species [*Hibiscus diversifolius?*] is very like *H. cannabinus* in appearance and is apparently more common in the Transvaal. The main stem and branches, however, are more prickly and more hairy than in *Hibiscus cannabinus*, and the leaves, instead of being lobed almost to the base, are only lobed about half-way down or a little deeper. The lobes, too, are fewer and broader. Other points of distinction are that the gland on the calyx is far less prominent than in *H. cannabinus*, which also has a light green foliage with green stems, whereas *H. diversifolius?* has darker green leaves with purple leaf-margins and nerves, and purplish stems and petioles. It is less branched than *H. cannabinus* and may therefore prove to be more suitable for fibre production.

Seed Collection.

The Manager of the Waterberg Farmers' Co-operative Society, P.O. Box 29, Nylstroom, will give information about purchasing seed of both the above species and collectors are advised to communicate with him in this connection

The total production of fibre from these plants for this season would be too small to warrant its processing for commercial purposes. The decortication of the plant can only be economically achieved on a large scale. The gathering of seeds, therefore, will be of major importance for a few seasons with a view to cultivating the plant on a commercial scale.

In connection with the harvesting of *Hibiscus* seed the Department of Commerce and Industries has supplied the following information, received from their Industrial Liaison Officer, Washington: Frost causes the seed pods to crack open, resulting in loss of seed, although light frost will not damage the seed to any extent. The likely time to harvest in the Waterberg area, therefore, would be through the second half of May to the first half of June, the idea being to postpone harvesting as long as possible without incurring frost damage.

The seed is harvested by hand. It is cut with a knife and the stubble is left high, usually 1 to 2 feet, the plants being cut just below the first seed limbs. The seed shatters easily and it is best to cut the seed on cloudy days or during the forenoon, when the moisture will tend to prevent loss of seed by shattering.

Some of the best growers bind the plants in small bundles before putting them in shocks. This tends to hold the seed which shatters out. The plants, when harvested, are set up in large shocks around a saddle of four uncut stalks bent over and tied to prevent the shock from being blown down. After the shocks are completed they are tied with binder twine, for if the plants blow down, a very large proportion of the seed will be lost.

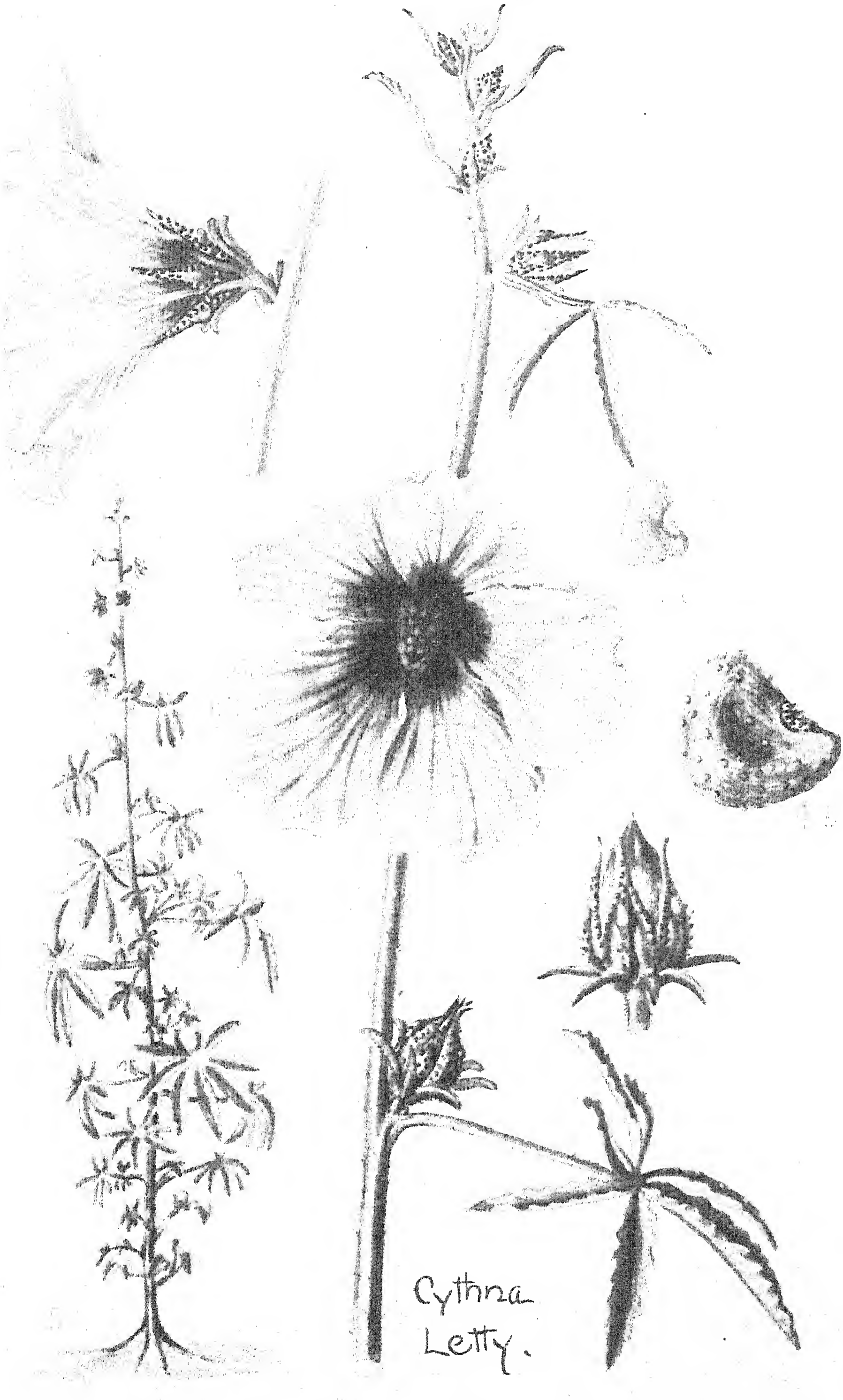

Fig. 1—*Hibiscus cannabinus* L.

Fig. 2—*Hibiscus* sp. cf. *H. diversifolius*

Thrashing.

The seed is thrashed as soon as the plants are thoroughly dried in the shock. Three to five days are usually required for the plants to dry in the shock, but it is best to thrash as soon as possible to avoid waste.

While moist weather is desirable for harvesting, dry weather is absolutely necessary for thrashing.

The seed is beaten off on a canvas spread on the ground. Stubbles are cut down and a space cleared next to a shock or between two or more shocks on to which the tarpaulin is spread. The stalks forming the saddle of the shock are cut and the entire shock is tipped over on to the tarpaulin. Men then beat off the seed with sticks. A swinging motion of the stick, so as to slide along the stalks in the direction of the tops, gives the best effect. When the seed on the upper side is beaten off the shock is rolled over with the sticks and the seed beaten from the other side. Then the entire shock is thrown off. The men handle the stalks entirely with their sticks and do not touch them with their hands except to throw the shock on to the tarpaulin.

The Cleaning and Storing of Seed.

The chaff and the seed beaten off is first put through a large, coarse sieve and then through a fanning mill. Most of the seed is recleaned with power fanning mills at the warehouses of the local seed dealers.

No special conditions are called for in the storage of the seed. The same principles of low temperature, dry conditions and suitable ventilation that apply to the storage of cereals, also apply here. It is known that storage in metal containers in the sun adversely affects the seed.

Plate 1.—Hibiscus cannabinus.

1. Terminal portion of a branch showing one open flower with buds above and one young fruit below.
2. Flower, side view.
3. Young fruit with calyx and involucel (natural size).
4. (*a*) Immature seed (x3).
   (*b*) Mature seed (x10).
5. Whole plant much reduced (this plant was young and so not as tall and branched as usual and the flowering portion not as long as usual).

Plate 2.—Hibiscus diversifolius. (?)

1. Terminal portion of a branch showing one open flower with buds above.
2. Flower, side view.
3. Young fruit with calyx and involucel (x3), showing nectar drops exuding from the glands on the calyx.
4. Mature seed (x10).
5. Whole plant much reduced, showing the purplish tinge to the main stem, branches and petioles.

The Treatment of Incubator Eggs.

P. E. F. Jooste, Lecturer in Pou'try, Grootfontein College of Agriculture, Middelburg, C.P.

SINCE poultry farming consists of various branches and the success or profitability of the undertaking as a whole depends on the success of *all* the individual branches, each should receive proper attention—and a few even special attention. In this connection we think of incubator eggs which do not always seem to receive the special attention which they merit.

As a rule, the selection of breeding pens is carried out very carefully. Vigorous cocks and hens are mated (*a*) for obtaining a high percentage of fertile eggs, and (*b*) for breeding strong and healthy chicks. In spite of this, however, the breeding results are often disappointing. The reason may be that the cocks or hens do not possess that quality which ensures a high hatchability. There are, however, other factors underlying infertility, among which the following may be cited:—

(1) Lack of desire for mating in certain hens.

(2) Disturbances amongst cocks or hens in breeding pens, as a result of fighting.

(3) A disproportionate number of hens to that of cocks.

(4) Preference for certain hens on the part of cocks.

(5) Infertility in cocks or hens.

(6) Incorrect feeding.

(7) Diseases such as colds, vent gleet, etc., amongst breeding birds.

The Testing of Cocks and Hens.

By making use of trapnests, the eggs of each hen may be marked and the hatchability of her eggs determined. To ascertain the influence of cocks, each cock should be mated with his group of hens in a separate run or house. This system requires more work, but is essential for maintaining the good qualities of a flock and breed according to such qualities.

Here is an example of what happened with various matings:—

Cock No.	Hen No.	Number of eggs placed in incubator.	Number of infertile eggs.	Dead embryos.	Dead in shell.	Healthy chicks.	Percentage hatched.
715	233	58	3	6	5	44	75·8
3500	233	8	1	2	3	2	25·0
4555	2649	34	—	6	4	24	70·5
3500	2649	24	2	5	7	10	41·6
3500	9630	11	11	—	—	—	—
4555	9630	9	1	—	1	7	77·7

The number of hens handled was probably insufficient, yet the figures show that cock No. 3500 yielded very poor results when mated with hen No. 9630 and even with No. 233. Since all the eggs of hen No. 9630 were infertile, the reason may be that the hen would not mate with No. 3500, or vice versa.

Temperatures.

Before a fertilized egg is laid, cell division has already taken place, since the egg has been subjected to a temperature of ±107° F. in the body of the hen for at least 18 hours. As soon as the temperature of the egg drops to below 68° F., however, cell division ceases. Nature protects this embryo, which has already undergone a period of growth, by covering it with a layer of thick white. It remains for man to lend a hand to assist nature.

Our country, especially the interior, is subjected to great extremes of temperature. During the night in the middle of winter, it is nothing exceptional for the temperature to drop to below 38° F. If the embryo is kept at this temperature for any length of time, it dies. If the temperature rises to 68°—70° F., it develops slowly and becomes very weak. Care must therefore be taken that the temperature of the room in which the eggs are stored, remains between 50° and 60° F.

Duration of Storage Period.

The hatchability of an egg is in direct proportion to the period of storage, the reason being that the evaporation of moisture from the egg and also from the inner and outer shell membranes, not only hampers the normal intake of oxygen, but also the giving off of carbon dioxide. (The former gas is vital to the growth of the embryo, whereas excessive carbon dioxide has a very detrimental influence.) Eggs must be as fresh as possible when placed in the incubator; 10 days is regarded as the maximum. The necessity for a dormant period which is often advocated, has not yet been proved. If eggs, especially incubator eggs which have been transported over long distances, need rest, they should rather lie dormant in the incubator. Note the following results obtained in an experiment:—

Age of eggs. Days.	No. of eggs.	No. of cracked eggs.	Infertile.	Dead embryos.	No. of chicks.	Percentage of chicks.
30	96	—	50	23	23	24·0
26	96	1	22	31	42	44·2
22	120	1	17	34	58	48·7
18	120	—	15	36	69	57·5
14	96	2	11	30	53	56·4

Selection of Incubator Eggs.

It has been found that abnormally large eggs do not hatch well. Those weighing from 2 to 2¼ ounces are most suitable for hatching purposes. In no circumstances should misshapen eggs or eggs with thin shells be used, for not only do they not hatch well, but the bad property of laying such eggs, is transmitted to the progeny. See that the shells are free from very fine cracks since such eggs easily break when they are turned in the incubator, and do not hatch.

The Turning of Eggs.

The turning of eggs during the storage period is of paramount importance. The embryo on the yolk of the egg floats in the white. Normally it cannot come into contact with the shell membrane since

it is surrounded by a layer of thick white, but since a large proportion of the yolk of an egg consists of fats, the yolk is continually inclined to rise and eventually to come into contact with the shell membrane. As evaporation progresses the embryo begins to adhere to the shell membrane, with fatal results. If the eggs are turned regularly, the yolk shifts around and more white comes between the yolk and the shell membrane.

The easiest method of turning eggs kept for hatching purposes is to pack them in a clean box with clean fillers and flats and then to turn the box daily, leaving it on its base one day, on its side the next day, on another side the next, etc. It stands to reason that if the box is not full, it must be filled with empty fillers and flats.

The Washing of Eggs.

The bloom on a newly-laid egg serves as a protection to the contents of the egg. As soon as the egg is washed or rubbed, this bloom is destroyed. According to experiments with 400 incubator eggs of which half were washed, it was found that the unwashed eggs hatched 12½ per cent. better. If one of the eggs in a nest breaks and dirties the others, the dirty eggs will hatch out poorly, if at all. The only expedient in such a case is to wash the eggs if they are to be used for hatching purposes. Dirty eggs can be avoided, however, by providing sufficient nests—at least one for every 5 hens. Put dry, clean straw or other material in the nests and remove the eggs two or three times a day. Broody hens must not be allowed to sleep in the nests at night.

During the past year there was an unprecedented demand for day-old chicks, pullets and incubator eggs. Sellers must regard it as their duty to sell only their best products and buyers must make sure that they receive only the very best. Breeders who make use of trapnests and pay careful attention to quality and size of the egg, vigour and high hatchability, etc., are entitled to better prices

Change of Date of Short Courses—Stellenbosch-Elsenburg.

The date of the short course in Home Economics which should have been held at the above College from 30 June to 4 July 1947, has been changed to 29 September to 3 October 1947.

This alteration has been made to meet requests from several branches of the Women's Agricultural Association.

The Horse on the Farm.

Part VI.—The Production, Improvement and Registration of Horses.

Dr. P. J. Schreuder and F. B. Wright, Senior Professional Officers (Horses).

THE horse is the aristocrat of the animal kingdom and a jewel among domestic animals. Not only has he rendered great utility services to mankind throughout the ages, continuing to do so to-day, but he has also always been closely associated with the ways of life and social status of individuals, in witness of which we have the chevaliers and knights who for many centuries were the recognized leaders of men and civilized society.

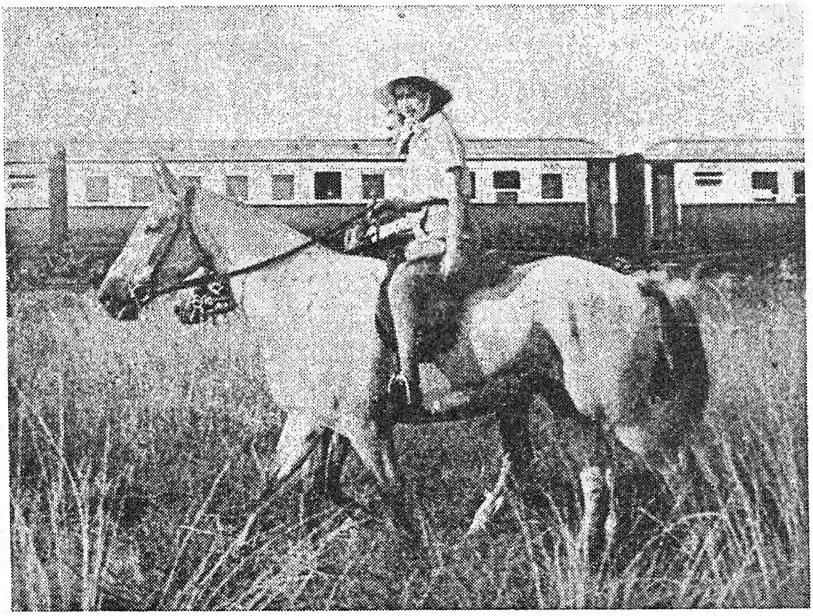

FIG. 1.—H.R.H. Princess Elizabeth enjoying a ride during the South African tour.

The companionship of master and mount instils a deep love and moulds a way of life with cultural values that no mechanical contraption can ever do.

The boy who learns that "his horse comes first", learns the most important lesson in successful livestock farming.

Riding Clubs.

On cannot recommend too strongly the establishment of riding clubs in urban and rural areas. Such clubs can afford a great deal of pleasure and benefit to young and old, and offer unrivalled opportunities for "getting together" at healthy and instructive meetings. These clubs may organize sports and gymkhanas, horse training lessons, lectures on equitation and horsemanship, and cross-

country rides to study soil reclamation works and pasture improvement schemes or to inspect crops. Little local shows may be organized in preparation for larger events, while riding club members may advance to *polo clubs.*

Riding clubs are training grounds for more serious enterprises, namely, the establishment of studs or horse improvement schemes.

Horse Improvement Measures.

In various countries there are different schemes for the improvement of horses, often State-aided but also largely operated by private enterprise. The most common method is the *premium sire scheme* in which a committee of horse breeders in co-operation with a Government department selects stallions and pays a premium or subsidy; such selected stallions are then at the disposal of horse breeders in prescribed districts or areas and make their rounds to applicants' farms. These "travelling stallions" have contributed very largely to the improvement of the horse stock of countries operating such a scheme.

We find this scheme most productive of satisfactory results in countries where promotive and protective legislation is in force along the lines known to us in the Cattle Improvement Act. In some countries the State maintains large studs for the benefit of breeders and also for the production of horses used in Government service. The U.S.A. and several other countries maintain large remount stations in order to secure an assured supply of good horses for State services.

In the Union the S.A. Police maintains a large stud of 20 stallions and several hundred mares to help keep the mounted police adequately supplied with good animals.

Government Studs.

Since the earliest days the Dutch governors of the Cape and their successors maintained large studs for the improvement of the country's horse stock.

Shortly after the war of 1899-1902 the Transvaal and Orange Free State government established large studs to help rehabilitate the the depleted and deteriorated horse stock. These studs were forced to close down when the first wave of motor-mindedness of the twenties caused farmers to lose a correct perspective of the place of the horse in the farming industries of the Union. State horse-breeding operations were confined to the agricultural colleges where small studs of draught horses—first Clydesdales and then Percherons—were maintained.

When horse-breeding interests revived in the thirties, the Government once again instituted a horse-improvement scheme for the benefit of farmers, and stationed additional stallions at the agricultural colleges and certain experiment stations. This scheme has shown progressive improvement since its inception in 1939, just before the beginning of World War II. To date 1,402 mares have been served by Percheron and Thoroughbred stallions, and also a small number of jennies by registered stud jacks. The scheme was handicapped by restricting war conditions but the stimulus given to horse-breeding by the insecure position of mechanized power assured increasing support for the scheme.

The present-day demand for good utility types of farm-work and riding horses and larger, stronger mules is such that the continuation and extension of these improvement measures will be most helpful towards a rehabilitation of this branch of our pastoral industries.

Horse Breeders' Societies.

The revival of interest in equine affairs noticeable in the thirties has manifested itself in various practical forms. In addition to the Government reintroduction of stud services for farmers, farmers themselves have become more articulate and active. Old stalwarts and other breeders gathered in conference and established the first horse breeders' societies.

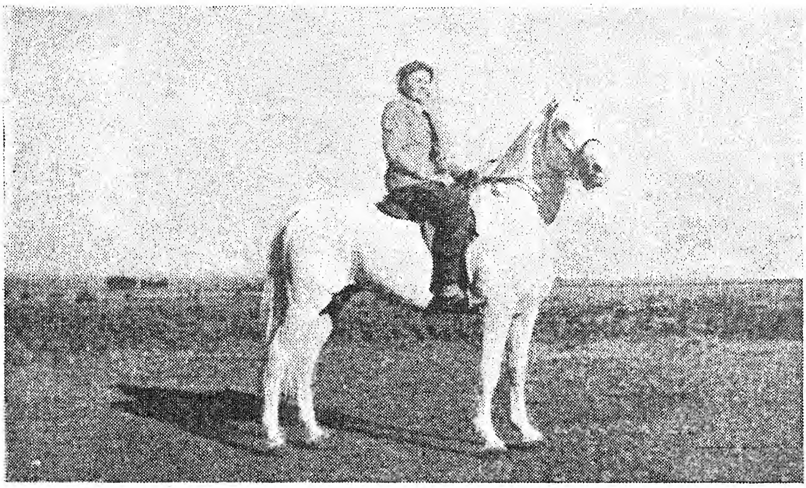

FIG. 2.—A Free State lass on a big Arab.

The Horse and Mule Breeders' Society of S.A. established in 1937 and operating as a commercial and propaganda body for the improvement of our equine stock became the parent body of other societies, some of which are now functioning under the protection and control of the Registration of Pedigree Livestock Act No. 22 of 1920.

The Percheron Horse Breeders' Society of S.A. was founded in 1939, and the Clydesdale Horse Breeders' Society of S.A. in 1946. Both Societies are affiliated to the S.A. Stud Book Association under the above Act. Light-horse breeders promote their interests through the Saddle Horse Society of S.A. and the Rhodesias. Founded in 1943 owing to the scarcity and also the diversity of material, this society is as yet in the formative stages of creating the desired type of South African saddle horse and is applying the recognized methods of inspection and selection of standard-bred foundation breeding stock to achieve its aims.

Private Enterprise.

The promotion and maintainance of any branch of farming enterprise are largely in the hands of those who supply a demand that is worthwhile, and in this connection influential representative and organized public bodies can make a considerable contribution towards the breeding and use of horses.

There are numerous ways and means of maintaining a high standard of quality, efficiency and performance in a country's horse stock. So, for example, the racecourse and all that is associated with it—selective breeding, exhaustive tests for stamina, vigour and breeding ability, approved breeding and maintenance methods, to

mention only a few factors—play no mean part in horse-breeding interests.

Agricultural Shows.

Most often the horse entries at agricultural shows are not only the most numerous but also the most attractive. Unfortunately the educative and promotive value of such entries is seldom fully exploited. Breeders and other interested visitors are denied instructive comparative information on the entries. Lack of time, congestion and overlapping of the judging of different classes prevent the student-breeder from obtaining the much needed information; judges do not give a comparative review of the placings and merits of exhibits; there are no meetings of groups of similar interests and most visitors come away from an event costing much hard work and expense with a jumble of a few showy peeps at a variety of classes and types. Most shows stress the mere display side of entries, overlooking the more important utility aspects. Greater importance should be attached to performance and to production classes. It is more important to grant high awards to the *progeny* of sires or dams than to such individuals; many breeders can buy high-class breeding stock but to *produce* high-class stock merits higher awards. Similarly, teams properly equipped in various outfits should be preferred to mere individuals.

The agricultural show should support the utility aspects of horses, leaving the ring events to riding and polo clubs. Since the horse section is often depended on to serve as a special attraction, every effort must be made to make these "utility" classes as attractive as possible; six or more teams of two or four properly equipped "heavies" or teams of eight lighter horses or mules, together with sire and dam progeny classes, would afford much pleasure and be a great attraction to both the practical farmer and casual visitor.

Horse Improvement Schemes.

Progressive farmers and members of different horse-breeders' societies may institute and organize a horse-improvement scheme of their own, in which only "approved" stallions are used. A selection committee is appointed and acts according to fixed standards. In time to come the areas in which such schemes are undertaken, would become recognized reservoirs or supply centres of good breeding and work stock.

Such movements would ultimately secure wider adoption and grow into a national force which would be in a position to claim State aid in the provision of funds and legislation.

The Production and Registration of Horses.

There are two main systems of horse production, viz. (1) the extensive, or ranching system, where a troop of mares, sometimes numbering up to 300, is run with little or indifferent supervision or attention, and (2) the system where mule breeding forms the major part of the undertaking, the animals being rounded up periodically for branding and the making up of sale lots.

In the latter case stallions and jacks of various degrees of breeding are run with the mares during the breeding season and often all the year round.

The uneconomical and wasteful aspects of this sort of animal breeding are very obvious and of recent years many farmers have

taken steps to bring their equine breeding operations within profitable and respectable limits. We are becoming more horse-minded and more conscious of veld and soil conservation and good land use. We feel that every animal unit must count. We know that a good

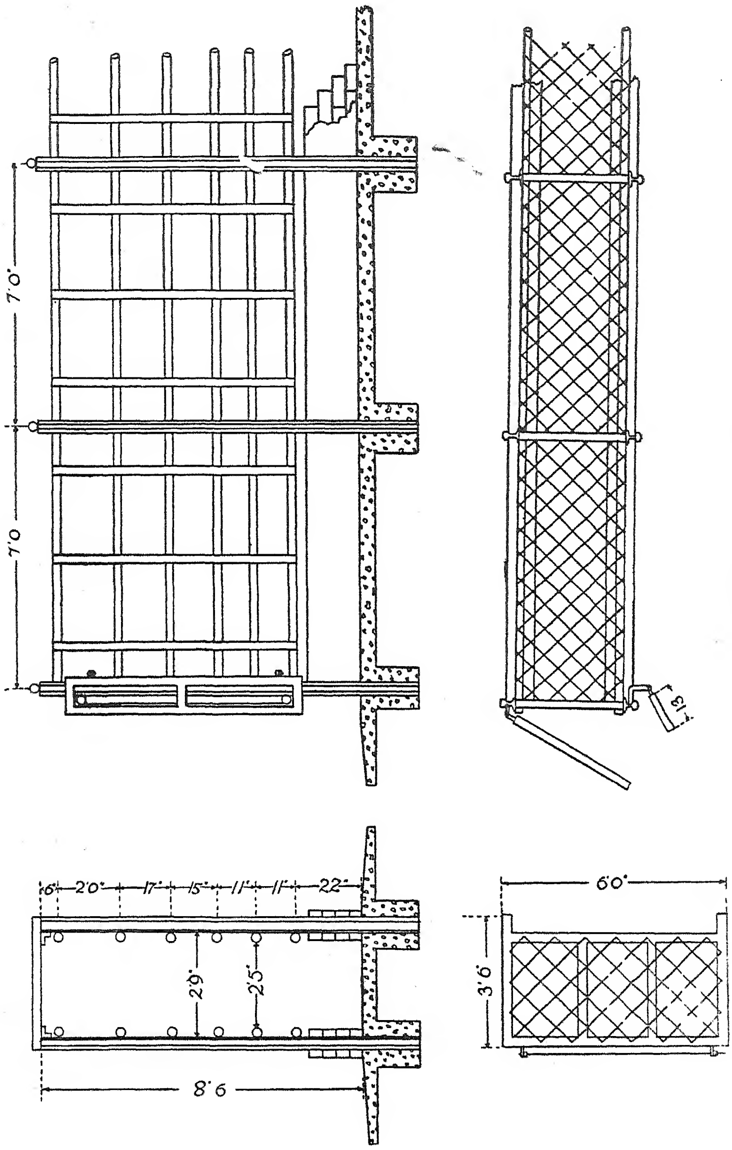

FIG. 3.—Diagrams of horse crush.

(a) Upper left :—Cross section. (b) Upper right :—Longitudinal section.
(c) Lower left :—Gate. (d) Lower right :—Plan.

horse or mule always realizes a good price. So why not breed such animals, instead of numerous unwanted unusable beasts that utilize veld and attention that could profitably be given to better stock.

The horse, like the dairy cow, demands special care and treatment; they are both long-term investments. The badly bred, unproductive horse is a liability and often drives the would-be user of horses to donkey teams or tractors. In some countries bone and meat meal factories find a use for him; but up to the present this has not been the case in South Africa.

Stables, Exercise Yards and Paddocks.

The horse section on a farm or horse farm needs, besides capital, all the planning and operative knowledge required for any other farming enterprise. First essentials are suitability of the area and the farm in particular, good lime soils, good grazing and good supplies of supplementary feeds. Then comes the necessary equipment, stables, stalls, paddocks, grazing camps and also exercise yards for stallions during periods when they are not at work. A paddock for mares due to foal, and another for young stock, a service paddock, a service stanchion and a horse crush are further indispensable adjuncts. (See accompanying diagrams). The roping of 50 or more young animals for branding, inoculation, etc., sometimes results not only in broken backs but also in broken necks.

There are many different plans for buildings, yards, and paddocks for all sorts and types of farms and climatic conditions, and for different classes of horses. In the erection of buildings, paddocks, yards, drinking troughs and service yard, the breeder must carefully consider various factors. In the first place the general lay-out of the main farm buildings must be taken into account; frequently economy of time, labour, personnel and ease of supervision is overlooked.

Stables.—In South Africa all doors should face north. The top door must be slatted or barred (most stable doors are of the barn type although sliding doors are to be preferred), and windows 6 feet up are also barred so as to let in as much sunlight as possible. The south, east or west windows must be high up and capable of being shut properly. In large communal stables ventilators are installed in the roof. Small yards leading off each stall or box are very desirable but not always possible; therefore, additional and safe exercise yards are indispensable. Stallion stalls or boxes should be away from those of mares or face away from them.

Sanitation, ventilation, freedom from rats and vermin, and fire prevention must receive due consideration in the lay-out, as well as the choice and type of building material. The best kind of floor for stables is still a matter of controversy and choice. There are many objections against concrete or brick floors, and possibly as many against hard earthen floors. Where ample paddocking can be provided, concrete or brick floors well bedded will, of course, be more permanent and also more hygienic. The surface should be roughish and slope away slightly from the manger for proper drainage. The stable should be of satisfactory size and have a ceiling about 10 to 12 feet high. In a very large building ventilators are installed in a peaked roof, and no ceiling is necessary.

The stallion's box should be provided with a good steel manger and a hay rack at the same level. Overhead slatted hay racks should be avoided; rather feed the hay in one corner on the floor.

Exercise yard.—A safe exercise yard is a very necessary item on a horse farm. If facilities do not exist to have a stallion ridden or walked or worked, he can be placed in a safe yard. A yard 50 yards by 50 yards, or even 100 yards by 25 yards, will furnish ample space for exercise. In this yard the stallion can be run at the end of a 17-foot lounging rope with the groom arranging the trotting in a

wide circle. Such a yard is enclosed with wooden rails supported by strong posts every 10 or 15 feet. Three rails are often deemed sufficient. The bottom rail is 3 feet from the ground and the others are 1½ foot apart, giving a fence 6 feet high. All connections must be smooth to prevent scratches or other injury.

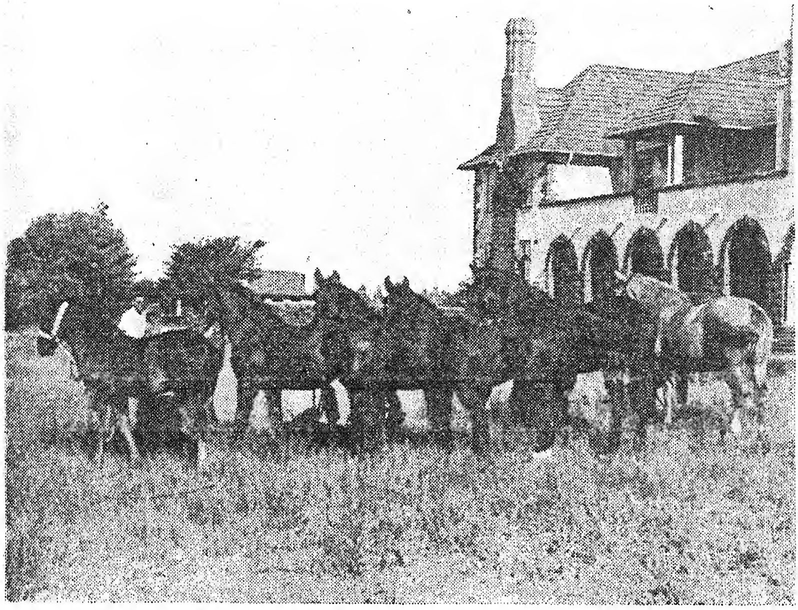

FIG. 4.—Young registered Percherons showing good care and management.

Paddocks.—A series of paddocks providing good grazing, and made self-contained and comfortable by providing shade and water, is a very necessary adjunct to the successful management and rearing of different classes of horses, especially young stock and brood mares.

It is imperative that different classes of horses be kept apart. Dry and foaling mares should not be run together. Mares with foals at foot, filly and colt lots, work horses, dry mares—all require separate paddocks.

Colts are separated from fillies when they reach the age of twelve months as they then become too playful and should begin their training, if this has not started at birth.

Paddocks should not be overstocked, particularly those used for foaling mares, mares with foal at foot, or filly and colt lots. They should be rested and refreshened. Established pastures will be a great acquisition on the horse farm, especially for mares with foals at foot, weaners or yearlings. A few hours' grazing each day where such paddocks are limited, will be most beneficial.

The horse breeder must appreciate very fully, and be convinced of, the superior value of good grazing for the successful development of good horses.

Founding a Stud.

It is a fundamental fact that any enterprising man can start in a small way according to his pocket and the limits of his facilities and build up a stud by known and approved principles to a status of profit and high standard. Select the best mares from a troop or purchase discriminatingly a stud of brood mares or fillies to the number that can be maintained with approval. Secure a registered stallion or make use of the Government scheme for farmers or of a private stud scheme. Breed and produce what the market demands. The market for good horses is always good.

Mule Breeding.

As the maintenance and development of different classes of stud horses are discussed in another chapter, only a few helpful suggestions for the larger stud mainly engaged in mule breeding are offered here.

To run the whole troop in one lot is simply courting disaster. Mares due to foal should be separated from other classes of horses and other livestock, especially mules. Attempts must be made to overwinter such mares on reserved pastures till weaning time when they are moved without weanlings to a reserved camp or paddock for the next foaling season. Before the mares are moved to this camp or paddock, it must be combed for any obstruction that may cause accidents to newborn foals; antbear holes and sloots or dongas, for example, must be filled in and drinking troughs or dams made safe.

Every effort must be made to get mares into good foaling condition. If grazing in the reserved camp is insufficient, supplementary feeding must be supplied. Any of the recognized hays, with the addition of a good legume hay, will go a long way towards achieving better results. Under overstocked conditions, and also with a mob of inferior stock, supplementary feeding is costly—but why waste good land on such a proposition?

The weanlings should be maintained on good veld, but during winter supplementary feeding is indispensable in order to promote continued growth. A bone meal and/or calcium carbonate or phosphate lick is very necessary. The lack of quality and size in our horse stock is directly due to the stunting of weanlings during the first winter. An inexpensive shed with hay racks leading off a large kraal well bedded with clean grass hay or straw where the weaners can be fed some nutritious hay during the night, contributes greatly to success. This treatment of foals tends to tame them and reduces the cruelty of crush and lasso at training age.

A stud of registered horses should only be conducted by a master breeder and horse lover who has first operated with success on general lines, before undertaking an advanced breeding proposition. He should know all the elementary and advanced facts and practices of horsemastership, and have an intimate knowledge of the breed characteristics of his own and other breeds of horses, of pedigrees, blood lines, records of performances and market demands.

He will cut his coat according to his cloth and maintain only that number which he can develop with profit—without stunting of valuable well-bred colts.

Mares due to foal are moved to individual foaling paddocks three to four weeks before foaling. When newborn foals are ten to fourteen

days old, they can join other mares with foals at foot without any risk of being fatally kicked. The good horseman starts his training right here. Foals are extraordinarily prone to show cupboard love. A lump of sugar, salt or raisins will soon make them pets. They come at a call and can be handled and petted; feet are lifted, limbs

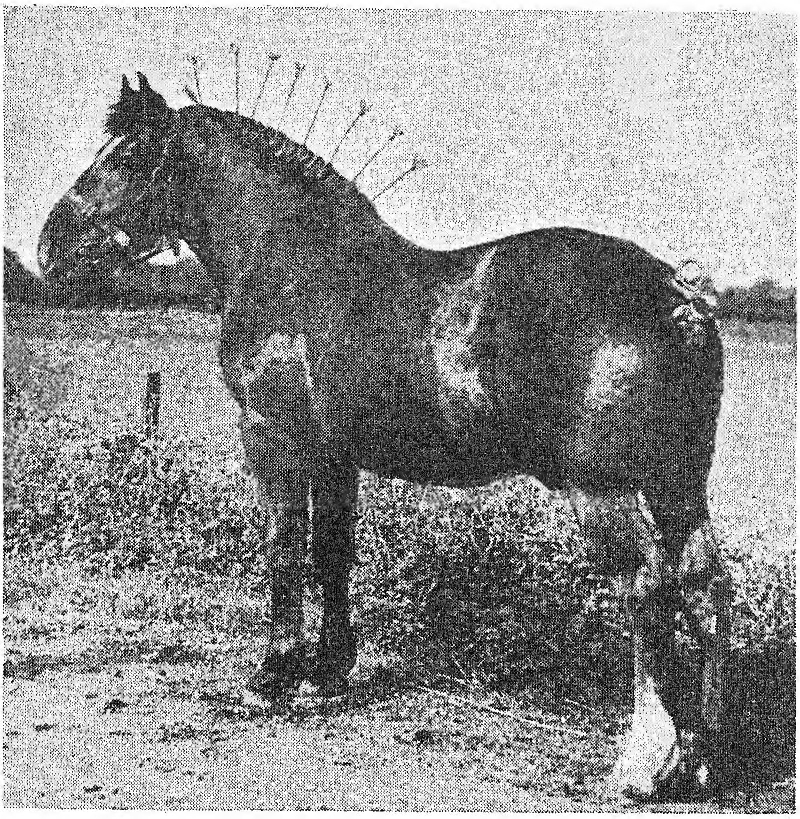

FIG. 5—Histon Dictator, now at the Central Stud, Grootfontein College of Agriculture. A well developed 2-year-old colt.

are rubbed, and the battle of training them is more than won. In this way the cruelty attached to the use of crush and lasso (vang-riem) or farrier straps and hobbles can practically be eliminated.

The treatment during weanling and yearling stages must be such that development is continuous. Our climate is very temperate compared with that of other horse-raising countries and we can reduce stabling to a minimum, provided feed supplies are ample and nutritious. To coddle colts is often harmful, but so is unnecessary "hardening" by leaving them on depleted pastures during frosty nights in biting wind and inclement weather.

Registration.

As indicated elsewhere, there are horse-breeders' societies affiliated to the South African Studbook Association, while registered horses of other breeds are registered with the S.A.S.B.A.

The stud breeder will, of course, become a live member of his society and become *au fait* with all the rules and regulations of his society. We use the words "live member" intentionally because endless trouble and expense often result from the negligence of some breeders in not observing correct registration procedure.

Stud Books or Herd Registers.

Any kind of business requires at least a simple and effective system of recording and bookkeeping. The horse breeder must know the ancestry of his animals as well as their performances in the production of work and reproduction. He must know when valuable mares are due to foal so that proper arrangements can be made for safe and satisfactory results. He must know whether his horses are mere boarders or a paying branch of his farming enterprise.

Properly arranged stud books exist and should be in the hands of every horse breeder. All the necessary data can be recorded here, supported by a "day" book or notebook in which timely and seasonal records are entered.

A herd register or stud book must contain the name, age, registration number, a full description, identification marks, a pedigree of at least three generations, weight and height and other important measurements. (Measurements of cannon, knee and hock, heart girth, forearm, gaskin, width of chest, etc., may also be recorded here.) Each animal has its own page giving its full pedigree and history, and photographs may also be pasted in. These will greatly enhance the value of such a record for those who follow on.

Identification Systems.

Branding.—It is most necessary that an animal should be readily identifiable, i.e. in respect of individual and ownership. There are various identification systems, the most common being branding. Branding is repugnant to many horse breeders, but if the system is good and the branding carefully done, very little disfigurement results. The marks may, for example, be A. 101—A for Adamson (ownership) and 101 for identification of the particular animal whose history is recorded in the private stud register.

A brand for individual identification generally consists of numerals used consecutively, while a single letter is often enough for identification of ownership.

A three-inch high brand with 1/16 inch cut on the neck, croup, thigh or shoulder is readily seen at a reasonable distance. The iron must not be red hot and, if the coat of hair is short or shorn, need not be applied for longer than a second.

Tattooing.—In a small stud of valuable animals tattooing on the gum is favoured. Tattooing sets are obtainable and if the instructions are carefully followed, a good and permanent mark may be left.

Ear notches are seldom, if ever, applied to horses, nor are *ear tags*. None of these systems is infallible, as the marks may be mutilated or destroyed. Therefore, a careful description giving any particular mark, colouring or blemish is very valuable.

Know Your Farm Business.

O. E. Burger, Professional Officer, Division of Economics and Markets.

THE economic world of to-day respects one type of person only, namely *the man who knows his business*. Consequently, the chances of the person, who has neither the inclination nor the energy to become the absolute master of his profession or business, to attain success in a productive or business community are very slender; gradually but surely and mercilessly he is pushed out and left behind.

This truth is particularly applicable to the farming community. Modern farming is a business undertaking and it is only the progressive farmer, who continually has improvement and increased knowledge in mind, that really is successful.

Unfortunately, however, a serious misunderstanding persists, even among otherwise well-informed farmers, in regard to the scope of the knowledge required by the farmer who desires to understand his farm business thoroughly. Of primary importance is a knowledge of farming matters in general, to entitle a person to be called by the name *farmer* or *agricultural producer*. This knowledge, no matter how thorough or wide in its scope, represents, however, nothing more than a general qualification; *the real test is embodied in the requirement that the farmer should be thoroughly acquainted with, and informed in regard to, the particulars of his own farm.* The discussion hereunder is more specifically directed towards this aspect of the farmer and his business.

Keeping a Farm Record.

It is not an easy task constantly to keep in touch with, and to be fully informed about, all the details of one's business. It is practically impossible for the farmer *to remember* in detail, for example, all the transactions which might influence his business policy. Besides this, however, there are innumerable facts and considerations, such as stock increases and losses, varying numbers, quantities, values and funds, crops and crop failures, labour, draught animals, machinery, etc., which should be borne in mind in one way or another and which must necessarily be used with a fair amount of accuracy in connection with the future planning of the farm business.

No farmer can possibly know his farm business thoroughly if he has to depend entirely on his memory. Even if he dislikes the idea of bookkeeping, he should at least keep record of certain physical aspects of, and important transactions and occurrences on, his farm. Depending on the completeness or reliability of such a record, this is actually what the term *bookkeeping* should in the first instance convey to the farmer. Far too many of our farmers continue to harbour a grudge against the word bookkeeping without stopping to think what it actually means in practice.

No matter from what angle we regard this question, one point stands out clearly, namely that, without bookkeeping in some form or other, the manager of a farm (or any other business) can hardly get a correct perspective of his undertaking. In any case, an honest attempt at bookkeeping at least has the advantage that the farmer will pay more attention to the details of his farm business. If certain records are correctly kept and interpreted, they will eventually lead to a better understanding of farming as a whole and,

consequently, to continual improvements, greater efficiency and higher profits. More and more farmers are continually becoming convinced that they can increase their income through adopt a system of bookkeeping.

A further consideration is that of indication or measurement. What, for example, is the use of a watch without hands? Or, to put the question differently: What misfortune threatens a ship without compass and steering adrift on the ocean? *This is exactly the position in regard to farming when the farmer does not plan ahead, with definite facts and figures at his disposal.* The captain (in the body of the farmer) may be on his ship, but he is absolutely powerless without the equipment required for the determination of direction.

Furthermore, the old argument that the farmer is always busy out-of-doors and has no time for figures, is stale and out of date. One realizes, however, that the capable and diligent farmer is a busy man and that additional duties, such as bookkeeping, for example, should not take up too much of his time.

The New Method of Farm Bookkeeping and Calculations.

Knowing that the hard-working farmer is always pressed for time, the Division of Economics and Markets has for some time been engaged in enlightening farmers on a system of bookkeeping which will give them the best results with a minimum of labour and sacrifice. In 1940 the Division summarized these ideas in an " Account Book for Farmers ".

Let us state immediately that it is not necessary for the farmer to be trained in bookkeeping if he desires to adopt this simplified and practical system of accounting, specially devised for farmers in South Africa.

We know that many farmers in the Union already fully realize the value of figures, bookkeeping, etc.; what these progressive farmers had been waiting for all the time, was an effective and practical account book.

Consequently a careful study was made of the position during 1938, with a view to compiling an account book which would, once and for all, meet the numerous requirements of farmers in this respect. The result of this study was the publication, in 1940, of the " Account Book for Farmers " referred to above. Since, in compiling this book, the Division sought and obtained valuable advice from farmers themselves, it may rightly be said that farmers made a direct contribution towards the development of their own bookkeeping system.

However, as we all know, the farming community is made up of numerous classes of farmers; consequently their requirements, as far as bookkeeping is concerned, are extremely divergent. The first problem with which the compilers of the book were faced was, therefore, how to satisfy all farmers.

We feel that we can safely contend that the attempt at satisfying the bookkeeping requirements of all classes of farmers was indeed a success, but this could be accomplished only by devising a very comprehensive system. *Let it therefore be emphasized immediately that it is unnecessary for any farmer to complete all the available forms; each one need merely use those forms which provide for his own particular requirements.* And since the book is based on the " loose leaf " system, the unnecessary forms may, for the sake of convenience, be removed.

Self-training in Bookkeeping.

But no progressive person will remain satisfied with any rigid, incomplete system for long; satisfaction comes only from the knowledge that there is scope for development and progress. One of the main objects of this bookkeeping system is, therefore, *self-education in bookkeeping*. Consequently, a brief, simple and concise explanation was needed, in the first instance, for the account or work books (Part I of the set). All that the farmer has to do, if he knows nothing about bookkeeping, is to start with the simplest records, as indicated in the Explanations, and systematically to use more forms from year to year—that is, as his bookkeeping requirements may dictate. It was mainly to render this possible that the "loose leaf" system was adopted.

The main objects of this new and simplified system of bookkeeping may then briefly be set out as follows:—

(1) The introduction of a system of bookkeeping which will be of use to every class of farmer in our country.

(2) To provide systematic self-education in bookkeeping for those farmers who did not have the opportunity of receiving instruction in the subject at school or at college.

(3) The final elimination of what is, for the farmer, a cumbersome, misleading and out-of-date commercial system of bookkeeping.

As we have already briefly explained the first two objects, we may now consider the third point, which is perhaps the most important.

A Purely Farm Bookkeeping System.

The writer is convinced that the older generation of farmers had such a dislike for bookkeeping chiefly because private interests offered them a system of bookkeeping which was in no way adapted to farming.

When we refer to farming as a business, we do not have in mind a commercial business. As every farmer realizes only too well, farming is an *organization* whose general character is that of an enterprise between a factory (sometimes even a mine) and a commercial business. For each of these undertakings an indispensable system of accounting had to be evolved to suit its particular demands. But if either of these bookkeeping systems were to be applied, unchanged, to agriculture (with its special character and peculiarities), the result would be confusing and misleading and a waste of the farmer's precious time.

A commercial bookkeeping system, for example, makes provision for a "Ledger" in which everything of importance to the business is recorded under separate headings or accounts. This requires a great deal of writing and book-work, but it is essential for the merchant; for the farmer, however, who only wishes to know what the total income and expenditure of his farming *as a whole* amounted to over a year, it is simply a waste of time. Moreover, the result is often misleading, because, in following the commercial practice, only cash items are entered on the accounts, whilst non-cash items (such as labour, cost of animal and mechanical power, etc.) are not included. In fact, the ordinary commercial system makes no provision for such cost items.

In view therefore of its special character, diversified farming particularly should, in the first instance, be regarded and treated as something indivisible. In other words, the result of the year's farming must be calculated for the *farm business as a whole*. The farmer who is not interested in an analysis of the various branches of his farming, or in costing, should not be burdened with a long series of separate accounts.

On the other hand, the farmer who wishes to undertake enterprise analysis must avoid the ledger systems; what he requires is proper cost records. Such a farmer should also realize from the outset that he requires professional and/or clerical assistance if he wishes to avoid disaster in such an ambitious attempt. He must remember that a careful and effective analysis of the various branches of his enterprise may result in great financial gain; consequently he will be able to afford the services of a part-time or full-time bookkeeper. On the other hand, faulty analysis of the branches of a business, by the farmer himself, may result in serious financial loss.

Adaptability to Modern Requirements.

There are already many enlightened and progressive farmers in our farming community; but what of those unfortunate individuals who have not yet awakened to the drastic changes which the course of time has brought about?

Let us remind these people of the fact that the modern farmer has an *annual income* which exceeds the total *capital investment* of the farmer of 50 years ago*. He borrows more money than the farmer of those days; he risks more money and credit; his costs are higher; he has a wider choice of products to produce—with a corresponding variety in the implements and equipment to be used; diseases and pests are far more prevalent; soil fertility is lower; new markets, locally and overseas, are available; ways and means of transport and retail marketing at his disposal are numerous; and many more drastic changes of a similar nature, which may please or displease him. Whatever his reaction might be, he should bear in mind that the chances to-day of making wrong decisions (which will undoubtedly lead to losses and retrogression) are much greater than 50 years ago. *In these circumstances it has become imperative for the farmer to make use of better business methods.*

The history of man and beast throughout the ages has taught us at least one lesson, namely that of *adaptation*. Without adaptation to changing conditions, progress is ruled out; even worse, deterioration and annihilation of the individual and his group are predetermined by the inexorable laws of Nature.

In regard to the farmer, adaptation to changing conditions means, in the first instance, reorganization of his farming, if necessary. Many farmers realize that certain alterations in the composition of their various enterprises or branches of farming have become absolutely necessary. However, for the majority of these farmers it is impossible to determine correctly the nature or extent of the desired alterations, because they have no particulars at their disposal in order to construct a basis for their decisions. But, unless the facts are known *it is impossible to recommend with certainty alterations or improvements in the system of farming practised in some definite area or on a particular farm*. The only answer to this is that a practical system of bookkeeping be applied. The latter will then serve as a basis for analysis and conclusions and for summarizing, at the end of each statistical year, the financial position of the farmer and his farm business.

Annual Summary of Results.

We are, however, now confronted with another difficult problem which had to be solved at the time when the "Account Book for Farmers" was compiled, namely the question of *summarizing*,

* "Farming is a Business", *Farmiug in South Africa*, January 1946.

which is also closely bound up with the idea of self-education in this line of knowledge.

Unless a farmer prefers making entries or calculations of certain subsidiary aspects only of his farm business, he will regard his bookkeeping as futile if, at the end of the year, he cannot summarize the details which have carefully been entered on the various records. This is, indeed, the only manner in which he can calculate the financial result of the year's business. It was also in this respect especially that the old commercial system of bookkeeping was so clumsy and unintelligible for the farmer—and thus directly responsible for many frustrated efforts at bookkeeping.

In the explanatory pamphlet (Part I of the set), the following three methods of summarizing are recommended and explained—each one adapted to the particulars which any farmer may wish to record:—

(1) A method for the majority of farmers who are interested only in *total* income and expenditure figures. In other words, this method was specially devised for the farmer who considers his farm business in the light of an indivisible unit. It should be pointed out that this is also the obvious method for purposes of income tax returns.

(2) A method for the comparatively large number of farmers who take a particular interest in the capital investment in their farms and who may, therefore, spend considerable time on an inventory. The financial result of the year's farming may, however, also be calculated in this manner; moreover, the farmer would have at his disposal a simplified and valuable balance sheet at the end of the year.

(3) A method for those few who are not only *interested* in the analysis of the various branches of their farming, but who are also in a position (technically and financially) to undertake such an analysis. Also in this case, however, provision is made for the calculation of the final result of the farm business as a whole.

Does Bookkeeping Pay?

We have repeatedly emphasized that bookkeeping, in some form or other, is indispensable to the farmer who wishes to know his farm business and who really desires to master the facts which largely determine the nature and circumstances, generally, of his undertaking. In case, however, there are still some farmers who are not yet convinced, let us take a closer view of the matter and consider whether bookkeeping is really worth-while or remunerative. In other words, let us try to answer the following question: To what extent is a farmer rewarded, through actual results, when he applies a bookkeeping system such as is contained in the "Account Book for Farmers"—no matter whether it is applied in its entirety or only in part?

In the first place, it must be pointed out that most of our farmers to-day keep a so-called pocket-book, since the farmer has learnt from experience that he cannot rely on his memory alone. In this little pocket-book he makes notes in regard to all the most important happenings or events on the farm and sometimes even of business transactions.

This is actually the beginning of all farm bookkeeping.

Investigation will show, however, that the pocket-books of most farmers contain insufficient information, since these books are small and very few details can be jotted down in them. Like other

half-truths, these incomplete notes on events and/or transactions may, therefore, definitely be misleading.

Having regard to this serious imperfection of the ordinary pocket-book, provision is made in the "Account Book for Farmers" for a *Diary* (or *Daybook*), which is merely a pocket-book in a large or more complete size. Although the farmer cannot carry the large leaves of the Diarv with him, he can always keep them on his desk, or in any other convenient place where he can make rough notes at any time during the day. Columns are provided for convenience so that any receipts or payments made during the day can be entered.

Substituting a complete diary for an incomplete pocket-book is certainly a big forward step for the beginner in bookkeeping. By making this change, he has turned a poor and half-hearted effort into a solid foundation for his system of accounting, on which he can build with confidence.

Of course, the beginner cannot expect his bookkeeping to enable him to start immediately with the calculation of the financial result of his activities during the year. His first reward is that, by making certain notes, he gains a better knowledge of his business and ensures that certain important matters, facts or figures do not slip his memory, even after many years. For the first year at least, the beginner will, therefore, have to concentrate on his Diary and its different branches, viz. the *Record of Products Produced on the Farm*, the *Livestock Register* and the *Labour Register*. These three records may be called specialized diaries, the first being of interest mainly to the grain and/or fruit farmer, and the second to the stock farmer. The third, of course, is concerned with labour generally.

The *analysis* of the financial transactions comes only with the next stage of development. If his general Diary has been kept according to instructions, the beginner will find all these transactions recorded there.

In the interest of the man who maintains that he is not in a position to devote time every day to bookkeeping, attention should be drawn to an important point in the technique of the proposed accounting system. This is that *daily* entries need only be made in the *Diary*. These rough notes can be jotted down quickly at any time during the day when the farmer enters the house. In this way the farmer will ensure that nothing of importance is forgotten or left out of his calculations at a later stage. The further handling of this material may then be postponed until some opportune time as, for example, a Saturday evening, a rainy day, or any other similar occasion.

In the next step he may choose between two alternative methods of developing his bookkeeping system further. Using his general Diary as basis, he may either put the *Cash Book* and *Credit Books* into operation, or proceed directly to the posting of the data contained in the Diary to the records of *Total Farm Receipts and Expenses*. The latter method is, of course, a short cut which eliminates a great deal of work, but is neither as effective nor as satisfactory as the first, since, where this method is applied, the bookkeeping system as a whole is incomplete.

With the data obtained in this way, together with a preliminary estimate of the capital increase or decrease during the year, the farmer can, already at this early stage, calculate the profit or loss

of the farm business as a whole at the end of the year. From this summary he will also be able to obtain all the details required for purposes of income tax returns. Moreover, the farmer now has at his disposal information about every penny owed by, and owing to, him; and about all the cash income and expenditure in connection with his business on any day of the month or year.

An Inventory.

The next step, that is for the man who desires to build up or develop a more complete system of accounting, will be the compiling of a property list, or the so-called taking of an *Inventory*. In the same way as the diary forms the basis of the running or working branch of the enterprise, the inventory constitutes the foundation on which the entire farm business rests—that is, from the point of view of capital investment. Why then the Inventory is not brought into operation at the very beginning, is a question which might well be asked. The answer is simply that the taking of a correct and reliable inventory is by no means an easy task for the beginner and he may be discouraged if he is confronted with this task at the outset. Although the inventory is taken only once a year, the valuation of the various capital items demands considerable experience and involves some mental strain.

In any case, taking a reliable inventory is very definitely a worthwhile effort, which will certainly bring its reward. It may even be said that, for the work it requires, the inventory contains more information, as a separate record, than any other record in the bookkeeping system. At this stage the farmer is not only in a position to make a very accurate calculation of his farm income and expenditure for the year, but he also has at his disposal a simplified and valuable balance sheet at the end of the year. With this in view, it will be advisable to put the "*Record of Farm Products Consumed in the House*" into operation. In this the housewife, or whoever is responsible for the housekeeping, will undoubtedly be of assistance.

Professional Assistance with Enterprise Analysis.

This, then, is as much as the majority of our farmers will achieve with their bookkeeping, since, in the next step, they will be confronted with so-called enterprise analysis, which is based on the same principles as cost accounting, and which is consequently highly exacting as far as book-work and calculations are concerned.

It has been pointed out above that enterprise analysis will require the part-time or full-time services of a bookkeeper or clerk. The main object with bookkeeping at this stage is not only to establish the relative profitability of the various branches of the farm business, but also to determine which of these branches or enterprises are actually unprofitable. The latter should then be eliminated or replaced—*without, however, upsetting the balance of the farm organization.*

It may seem unnecessary to point out how the farmer, in this instance, is actually rewarded in hard cash for his bookkeeping [that is, if he can detect the unprofitable, and therefore retarding, branch(es) in his organization], but then it goes without saying that his figures and analysis must be absolutely correct. With full confidence in the latter, he would also have the courage of his convictions and not hesitate to act on his findings, and thus re-organize, where necessary, or eliminate retarding and uneconomic factors.

As has been explained before, however, this reward does not

drop from the skies. It demands both sacrifice of time and concentration on figures. In the first place it requires knowledge of double-entry bookkeeping. Furthermore, use must be made of the complete *Labour Record* and all the other cost records, namely the records of *Draught Animal Costs, Machine Costs, Implement Costs* as well as the *Feedstuffs and Grazing Records.*

By means of double-entry bookkeeping, cash entries can be transferred from Cash and Credit Books and classified in the *Analysis Record of Total Farm Receipts and Expenses.* These totals are subsequently posted to the *Summarizing Statement,* together with the figures from the various cost distribution records. Only then is the process concluded in the *Final Summary Statement.*

Most probably, while reading through the last few pages, you have arrived at the unpleasant conclusion that you are no less than a stranger to your own enterprise and that actually you know very little about its statistical, economical or business aspects.

If this is the case, then you have made an important discovery to-day. As a matter of fact, by admitting it to yourself, you have already decided that you should have a better knowledge of your own farm business. All that remains is to act in accordance with your decision. This means that you will place an order immediately with the Government Printer, Bosman Street, Pretoria, for a set of the "Account Book for Farmers" (price 12s. 6d. per set, post-free).

As indicated previously, Part I of the set consists of a pamphlet, which explains the whole system and working of the various records. Should you, however, at any time experience difficulty with bookkeeping in general, or with the account book in particular, do not hesitate to consult the Division of Economics and Markets, Union Buildings, Pretoria. The sooner the farmers of South Africa become "figure conscious", the sooner our agricultural industry will be based and operated on business principles. Only then will the farmer be able to claim that he knows his business.

Sale of Karakul Sheep.

38 Karakul and 60 Karakul-Persian Crossbred Sheep will be sold by public auction at the Grootfontein College of Agriculture, Middelburg, Cape Province, on Tuesday, 22nd July 1947, at 10 a.m.

19 Karakul rams.

19 Karakul ewes.

60 Karakul-Persian Crossbred ewes.

All financial and trucking arrangements must be made with the auctioneers, Messrs. Kock and Kruger, Middelburg, Cape.

The Mango in South Africa.

Part II.—Propagation and Cultural Practices.*

Dr. Raimund H. Marloth, Officer in Charge, Sub-tropical Horticultural Research Station, Nelspruit.

JUDGING by the numerous publications available on the propagation of the mango, and considering its small relative importance in horticultural practices of the world, more than ordinary difficulty seems to have been experienced in this connection. This has been confirmed during three years of trials with vegetative propagation of the mango carried out at the Nelspruit Research Station.

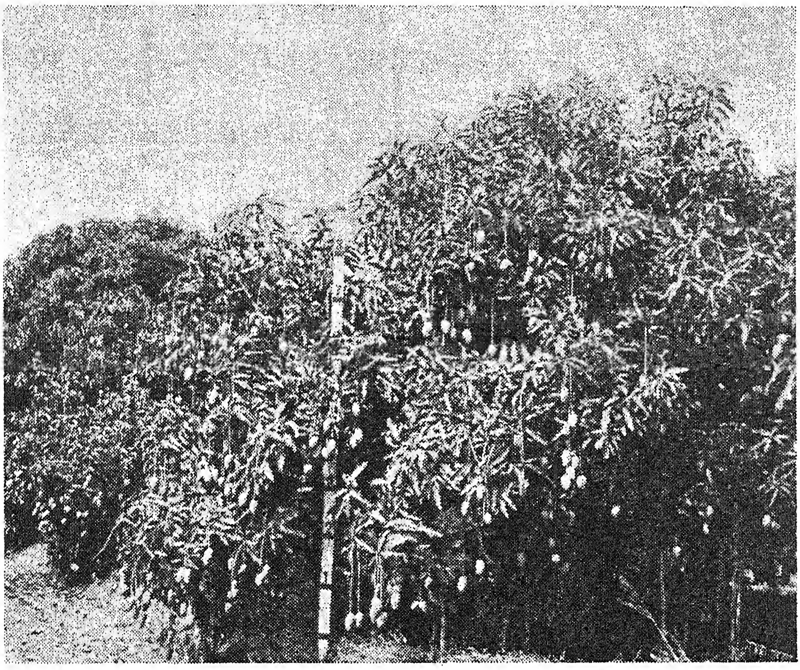

FIG. 1.—Fourteen-year-old Aman Dusailri approach-grafted tree bearing an excellent crop on poor soil.

Seedlings.

Certain types of mangoes exhibit polyembryony, which means that the seed is composed of apogamic or vegetative embryos in addition to the true embryo which can be fertilized. A single seed from fruit of one of these types will produce from one to five seedlings (one seed gave rise to eight seedlings), each one of which when separated could grow into a normal tree; it seems that the true embryo in this group is either often absent or fails to germinate. Trees raised from the growth of apogamic embryos are identical with the parent, being a vegetative offshoot thereof. Trees resulting from the germination of a fertilized embryo would have characters inherited from the mixed genetic make-up of both parents; such trees seldom produce fruit equal to that of the parents, and when in

* Part III of this article will deal with the production and marketing of mangoes.

rare instances they do produce superior fruit, it would be worthwhile to propagate from them vegetatively to form new varieties. Other mango types are monoembryonic, the seed having only one embryo which, when fertilized, gives rise to the type of tree just mentioned.

Most of the improved named Indian mango varieties are monoembryonic, and thus cannot be propagated from seed if they are to retain their true varietal characters. In the East Indies, the Philippines and South Africa the present best varieties are polyembryonic, and practically all propagation is by means of seedlings. The Sabre and Peach only seldom produce a seedling which is not true to type, but the Kidney produces a high proportion of such trees, and consequently has degenerated and lost its importance as a commercial variety.

Rootstocks.

Since seedlings from polyembryonic varieties have such a high degree of uniformity, it follows that such are best for stocks for approach-grafting, in-arching or budding. Rootstock experiments with the mango have been under way for many years in Java, India, Ceylon and more recently at the Nelspruit Station. No recommendations can as yet be made for the Union. It is known that varieties differ greatly in their budding compatibility with the same stock, but for all practical purposes for many years to come seeds of either the Peach or Sabre varieties will be suitable. The tendency of the Kidney to produce numerous varieties makes it unsuitable for stock purposes. The most desirable stock would seem to be one which grows vigorously, is uniform and has many fibrous roots. The latter will ensure better success at transplanting when the taproot-system is reduced. The Pullima sour mango of Ceylon seems to be of this type.

Approach-grafting.

For centuries in India approach-grafting has been the accepted method of vegetative propagation of the best mango varieties which do not come true from seed. This has also been used successfully in the Union, but a less costly and less laborious method for large-scale commercial nursery work is to be preferred. In this method the stock is established as a seedling in soil in a container, brought into juxta-position with a branch of the parent tree it is desired to propagate from, and a union effected between the two by means of a whip-and-tongue approach-graft. The stock and the parent branch should be of about equal diameter, and in cutting the whip the incisions should be such that two-thirds of each of the stock and the parent are severed so as to obtain at least a two-thirds' overlap. The union is tightly wrapped with raffia and the whole coated with a grafting wax.

In from two to three months satisfactory union should have been effected; severing of the lower portion of the parent and the top portion of the stock may now take place. At weekly intervals a notch in each of these is cut deeper in three stages, giving complete severance. The grafted tree should be kept in a lath-house until the union is well healed over, when the tree can be planted out in the orchard.

Budding.

From a practical commercial nurseryman's point of view the most satisfactory method of propagating trees is to plant seedlings in nursery rows, bud them with the desired varieties, lift the resultant budded trees bare-root, and despatch them in packing to the future

grower for direct planting. Unfortunately the mango is not as simple to work with as, for instance, citrus, being even more difficult than the avocado.

Naik (1941) in his extensive studies on the propagation of the mango in Madras Province at the Kodur Fruit Research Station found that in germinating seeds the best seedlings were obtained when seeds still in their husks were planted with the plumule (growing point) up, the top being about one inch below soil level. When weevil infestation is bad, it would be advisable to remove the kernels from the husks in order to eliminate badly eaten kernels.

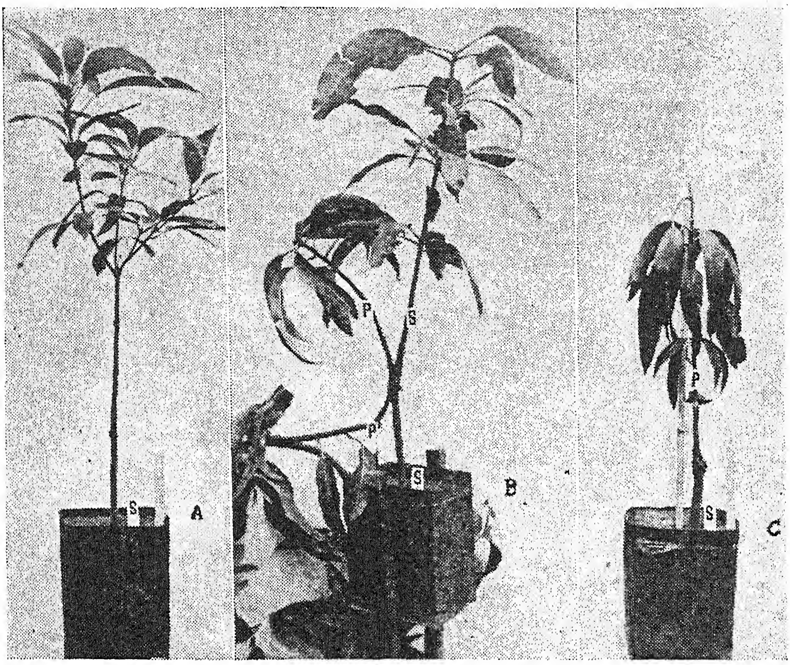

FIG. 2.—Approach-grafting of the mango. (A) Stock (s) established in container. (B) Stock (s) united with parent (p) by means of a whip-and-tongue approach-graft *in situ* at the parent tree. Note stakes driven into ground on which container is fastened by means of wire. (C) Grafted tree some months after severing from parent and ready for planting in orchard. Note first normal fruit already being borne.

This should be done soon after removal of the seeds from the fruits, and the kernels should not be allowed to dry out after their removal from the husks. Deeper trays than those usually used for seed germination in lath-houses are required, and there should be a minimum of nine inches of soil in such trays; for large-scale work open-ground shaded seed-beds should be used. Some two to four months after germination the seedlings can be planted bare-root into nursery rows, being spaced 2 feet apart in the rows and the rows 3 feet apart. Heavy defoliation of the seedlings about a week before lifting will reduce subsequent casualties. Individual shading with branchlets and keeping the soil wet until new growth starts will also assist in obtaining a better strike.

When the stocks are about 3 feet high and about $\frac{5}{8}$ths to $\frac{7}{8}$ths inch in diameter at ground level they are ready for budding. At the point of budding the bark must neither be still green nor already

completely brown, but at an intermediate stage. It has been found that one of the two main time factors contributing to successful budding is that the stocks must be at a stage where the new flush has just commenced, and when the young leaves are about 1 inch long.

The correct preparation and selection of the budwood is of the greatest importance. The best buds come from wood of the 2nd or 3rd flush from the ends of branches, the bark not having browned yet, and should be taken only at such times of the year as, or just before, the terminal buds open. Fourteen days before the budwood is required all leaf-blades are cut off from the petioles on the selected budstick while still on the parent tree. An ⅛th inch complete bark-girdle is made at the base of the stick. Between the subsequent cutting of the budstick and the actual budding as little delay as possible should occur, as bleeding renders the budwood unfit and a poor take will be obtained with day-old sticks.

A diversity of methods and details of technique in budding and grafting of mangoes is recommended by research workers in various mango-growing countries, but apparently none of these has to date been satisfactory enough to be generally adopted by commercial nurserymen. In Madras, Java and Hawaii side-grafting into vigorously growing stocks is much favoured.

Root-grafting, the modified Forkert shield-bud, and the patch-bud methods all have their champions. Gunaratnam (1946) in Ceylon has adopted the method whereby a shield-bud is placed on the cambium of the stock, which is bared by stripping down a flap of bark, such flap then being tied over the bud; this method is used for the propagation of many thousands of mango budlings yearly, a satisfactory 50 to 60 per cent. take being obtained. Another method of vegetative propagation with which success has now been achieved, is that of air-layering or marcotting, similar to that used with litchis; this success is due to the application of growth-promoting substances such as indole-acetic acid to the ringed portion of the branch before wrapping it with soil and sacking. (Named proprietary products for this purpose are for sale in South Africa).

After years of trials with different methods and techniques with varying materials at different seasons, the following method now used at the Nelspruit Station gives moderate success.

(*a*) Budwood is prepared as described above.

(*b*) The times of budding are October-November, February-March, and sometimes June-July just after the seedlings in the nursery have started to flush, provided suitable budwood is available on the parent trees.

(*c*) With stocks thicker than 1 inch in diameter, patch-budding, carried out according to ordinary technique, is used. Better results were obtained with younger stocks by using a shield-bud.

(*d*) The bud is not sliced off the budstick, but cut with the point and blade of the knife held at right angles to the budstick. Thus no wood of the budstick is cut off at all.

(*e*) The bud is removed from the budstick by applying pressure at the side. Bending the budstick away from the bud assists in loosening it.

(*f*) Tight tying over of the whole bud with raffia has been found to be preferable to the use of insulation tape, rubber strips, or grafting tape. No grafting wax need be applied over the raffia.

(*g*) The buds are untied three weeks later, and retied so as to leave the eye exposed.

(*h*) As on the average only 50 per cent. take may be expected, two buds per stock, placed on opposite sides, are usually inserted. These are put in sufficiently high on the stocks so as to allow for re-budding to be done *below* the first budding, should both buds on one stock be found to be dead when untied.

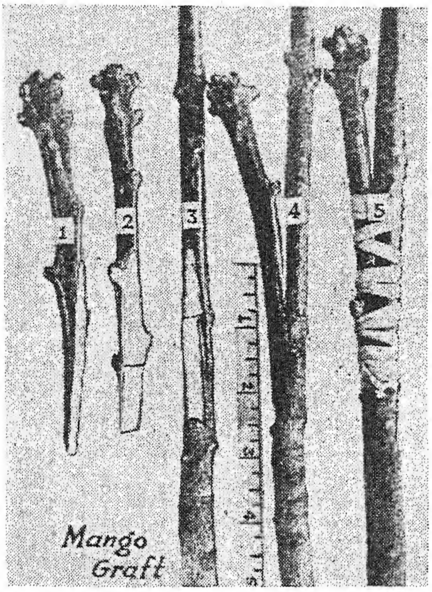

FIG. 3.—Side-grafting of the mango in Hawaii, as illustrated by Pope.

(*i*) As the bud seldom shoots until the next flush, some months later it might be necessary to re-tie the bud to avoid the raffia cutting into the bark of the growing stock.

(*j*) At the start of the flush following that in which the budding was done, the stock is cut ½ inch above the top of the former T-cut.

(*k*) Until such time as the bud begins to grow, and naturally thereafter, all suckers which arise from the stock, should be removed.

(*l*) Subsequent stubbing, tree-sealing and staking follows normal nursery procedure.

Transplanting.

Probably because of the predominant tap-root formation and the absence of top lateral fibrous roots, the mango presents difficulties in successful transplanting, be it a seedling or budded or in-arched tree. It has been found that if some of the main roots of the young tree are severed in the ground close to the stem some months before lifting, then the laterals and fibrous roots arising from such cuts assist the tree to establish itself more readily when set out in its permanent location. This applies particularly to the tap-root.

Best results are obtained by tinning the tree with a four-gallon tin while still in the nursery row, leaving this for a month or six weeks, and then severing the remaining roots at the bottom of the tin on lifting. This method is costly in labour, material, and transport charges, but it ensures the successful transplanting of a tree which has been relatively costly to produce. An alternate method is to cut the roots of the tree close to the stem with a spade, starting three months before lifting, and making one cut a foot below ground level underneath the tree and two cuts on different sides of the tree at intervals of three weeks each. If the tree is to be moved only a short distance from the nursery to the orchard site it could be lifted bare-root, otherwise tinning or balling must be resorted to.

Before actual lifting, the tree should be heavily defoliated, all tender growth being removed. Shading after planting must be done to protect the now exposed stem from sun-burn and drying out until such time as the growth of the new flush has hardened.

Cultural Practices.

The object of cultural practices is to obtain good healthy growth of trees and the regular annual maturing of a heavy crop of healthy, fine quality fruit. As far as the Union is concerned, not much definite information is available in this respect, but investigations are now under way to determine the most satisfactory economical and practical cultural programme for the commercial production of mangoes. An opinion cannot be given as to what extent alternate bearing and the production of 'small fruit' can be overcome. Allan (1945) gives quite a comprehensive programme, with particular reference to India, which would apply to the modern production of any fruit on a commercial scale, while all research workers in other mango-growing countries also recommend fairly extensive cultural practices. This is in contrast to the hitherto apparently accepted idea of most mango growers in the Union that once the tree is planted, it should be left to fend for itself.

Planting.—Before a new mango orchard is set out, thorough preparation of the land is necessary. On poor dry-land soils trees may be spaced as close as 25 feet apart, but on average soils, especially when irrigation can be practised, trees should not be closer than 35 feet, and 45 feet would not be too far apart under the best growing conditions. The trees bear their fruit on the outside, so that, if they are planted too close together a considerable reduction in the crop due to over-crowding will occur in later years when branches meet. In such a case it will be necessary either to remove alternate trees or to cut-back severely in between the rows.

The Peach grows more rapidly than the Sabre; trees of the former variety should therefore be planted further apart.

Adequately sized holes should be prepared, the larger the better, with a large bucket of kraal manure mixed with the soil at a depth of 2 feet to 3 feet. Trees should be shaded until the first growth flush has hardened, and should be adequately supplied with water even after they are well established.

Fertilizers.—Few experimental results of the fertilizing of mangoes in other countries are available; centuries of practical experience form the basis of present-day practices in India. Scientifically laid out experiments are now under way in several countries,

including South Africa, but until definite results from these become available it is necessary to rely on accepted practical recommendations based on trials and observations made elsewhere.

FIG. 4.—Peach mango orchard twenty-two years old planted on poor soil under dry-land conditions for first twelve years. Trees spaced too close at 30 ft. apart now that orchard is being irrigated and rate of growth has increased.

Nitrogen has the greatest influence on tree growth and cropping. The best form in which to apply this appears to be the organic. Vegetative growth at the time of the blossom flush in July-August (early spring) is to be discouraged, and nitrogen applications should be made in September-October (spring), so as to encourage vegetative growth flushes following this period, as it is on the shoots of this early summer flush that flowering occurs the following spring. It appears that the use of excess nitrogen on older trees is to be avoided, but on young growing trees liberal applications of kraal manure can be used. In Florida, U.S.A., on very sandy soils four applications per year of a complete inorganic mixture totalling 10 to 40 lb. for large trees are recommended.

All research workers emphasize the need of phosphate and potash for best yields and fruit quality in the fertilizing of mango trees. Popenoe (1929) reports increased yields in Cuba and in Florida resulting from potash applications, but in South African mango-growing areas most soils have abundant available potash so that for the present this may be left out of the fertilizer programme. On the other hand, most soils are deficient in phosphate, and provision must be made for the addition of this. Kraal manure will supply much of the phosphate requirement, but when cover-crops, regarded as a valuable adjunct to the fertilizer programme, are grown, applications of superphosphate should be made prior to the sowing of the cover-crop. Not only will additional growth of the cover-crop be obtained, but the phosphate will become available to the mango tree when this is turned under and disintegrates.

In 1945 the Nelspruit Research Station started a large-scale fertilizer experiment on bearing Peach and Sabre mango trees in

which the effects of inorganic nitrogen, phosphate, and kraal manure in properly replicated treatments are being tested. On account of the alternate bearing tendency of the mango, conclusions will not be drawn until the data obtained from at least five years' yields are statistically analysed. The Sabre trees have borne two average crops of fruit since the fertilizers were applied, and in all treatments the yield per tree was considerably more than that from trees which had not received fertilizer. The 'Peach' trees experienced two 'off' years, and with only very small crops of normal fruit being borne no indications of the effect of fertilizers could thus far be seen. Apparently the fertilizers applied did not influence the relative amount of 'small fruit' set.

Irrigation.—Although the mango tree is fairly drought resistant, its water requirement for good growth and fruiting is relatively high. Dry-land planting should not be made unless the *effective* rainfall, falling mainly in the summer months, is over 35 inches; there are very few suitable situations in the Union where this occurs. Thus it can be accepted that for commercial mango growing irrigation is necessary. The most critical period for irrigation in the summer-rainfall areas is from just prior to blossom break in June-July to when the summer rains set in. It is essential that mango trees should not be restricted as regards water from full-blossom on until the set fruit has fully sized, for not only will the set of the fruit and its subsequent development be affected, but the all-important early summer flush will not be as great as it might be, when a water shortage is experienced. Mango trees should not be irrigated after the summer rains cease in March, until the June irrigation; blossom-bud differentiation is increased when the trees are induced to rest during this period. Irrigations, when made, should be heavy enough to wet 100 per cent. of the root-area to a depth of at least 4 feet, but, if this is not possible, a partial irrigation will be better than none at all.

In the same orchard in which the Nelspruit Research Station is conducting a fertilizer experiment the general effect of the irrigation of mangoes is being observed. One half of the orchard receives no irrigation at all, and the other half is irrigated three times yearly during the dry season, the fertilizer treatments being replicated in both sections. The only definite influence noted thus far is that the mature fruit from trees which were irrigated were considerably larger than fruit from non-irrigated trees. General conclusions from this experiment cannot be drawn until the differential treatment has been given for at least five seasons.

Cultivation.—For years it as been accepted that the incidence of 'black spot' on the fruit, this term probably including both anthracnose and true black spot symptoms, is far greater in orchards which are cultivated, particularly during the fruit ripening season, than in orchards receiving no, or a minimum of, ploughing or discing. There is no scientific foundation for this, although it is possible that low-hanging fruit would be more heavily infected due to spore-carrying soil being splashed on to these fruits during rains in a clean cultivated orchard. It is recommended that the cultivation programme for a mango orchard be the same as for citrus and other fruit trees. Cover-crops during the summer rainy season not only prevent soil erosion but on being turned under improve the soil. During the rest of the year weeds only compete with the trees for water and plant food and should be disced in before they make much

[*Continued on page* 538.

Efficiency on the Farm.

Dr. John Fisher, Principal, College of Agriculture, Cedara.

AT the present time food production ranks as number one priority in the life of most nations. History will probably show that the past 2 or 3 years were all-time records for world shortages of essential foodstuffs. Our troubles are not yet behind us, and the time thus seems opportune to examine our farming activities to see whether any leaks can be closed or whether we cannot improve our general farming efficiency. The higher monetary wages paid to native labourers have considerably changed their mode of life, and they are entering into competition with Europeans for articles of food which were almost entirely European a few years ago. This fact should not cause undue worry, as, in due course, the change will be accepted by all. What is of serious consequence, however, is that the rise in monetary wages is seldom accompanied by greater efficiency or a larger output of work.

South Africa, like other countries, is experiencing a period of rising monetary wages and could also step up efficiency on the farm so as to face the future with greater assurance.

In most cases the native labourer is entirely unskilled, and remains so even after many years. Consequently, there are only certain jobs on the farm that he is capable of doing, and even these can be done in a right or a wrong way. The writer believes that it would pay handsome dividends if farmers were to spend some time in explaining to their native labourers why certain things are done in a certain way. A number of points will be mentioned to show how a little time and trouble spent in explanations would raise the efficiency of the farm as a whole.

Hoeing.

This is generally regarded as a job for the unskilled labourer because " any fool can use a hoe ", but even with a hoe there is a right and a wrong way to wield the implement. It is customary for natives to hoe crops from one side of the row and the hoeing consists largely of pulling the soil away from the line of crops, so that the plants fall over on their own, or are very easily blown over by the wind. In the case of maize, for example, cobs come to rest on the ground, and consequently rot or are gnawed by rodents or are destroyed by birds, etc. In addition, the fallen plants seriously interfere with the passage of cultivators or animals during cultural operations. The correct way is to straddle the row so that the soil is always pulled towards the roots of the plants. If maize is too tall to be straddled, it simply means that the hand-hoeing has been delayed far too long. The time to kill weeds is when they are very small. If possible, they should be destroyed whilst still in the seed-leaf stage.

Harrowing.

It has been observed on many farms that the value of the zig-zag harrow is not fully appreciated. Before new crops are planted, the whole field should be gone over with the zig-zag harrow so that the seed goes into clean ground. This harrowing will destroy thousands upon thousands of young weeds. It may also pay to cross-harrow with the zig-zag. In the case of maize, a further harrowing

can be given before the plants have appeared above ground, provided the plumule is not so near the surface as to be broken off by the harrow teeth. Another general harrowing can be given along the rows when the maize is 4 to 6 inches high. In this way, the entire field is covered and there are no more weeds in the row than between the rows. Then row-cultivation begins. First the arch cultivator is used as near the young maize as possible and then, if the rows are wide apart, cultivators are used between the rows.

If the above procedure is followed, not only is a much cleaner field obtained than where the planting is done without an immediate harrowing preceding the planting, but much less labour is expended in cleaning the field in succeeding years. What often happens, however, is that the first cultivation given is a row cultivation, when the whole field is almost a firm sod of young grass and weeds.

Ploughing.

What a common occurrence it is to see the leading share of a 2-furrow or 3-furrow plough taking only half the cut it ought to take. In the case of a 2-furrow plough, even if everything else is working 100 per cent., the implement can only be doing a 75 per cent. job. On South African farms, most ox-drawn ploughs have no higher efficiency than this. Imagine the extra cost to the farmer which this operation alone must entail for every field which is ploughed every year. If your plough is not fully efficient, ask your college of agriculture how its efficiency can be raised to its maximum. The trouble may have nothing to do with missing bolts, bent beams, lack of oil and grease, etc.

In laying out a field for ploughing, see that the two long sides are parallel, so that there will be no cuts in the middle or at the side of the field, involving many turnings for little work done, and trampling of the soil which has already been ploughed. This time spent in turning for very little work done is expensive. Fields should be 3 to 4 times as long as broad, the long sides being on the contour to economize in ploughing time.

Planting.

Though the preparation of a field may have been more costly up to this stage than it should have been, this is no reason for a 50 per cent. stand of crop. Planting is another operation in which efficiency can be considerably raised. Certain losses in the stand of a crop are, of course, inevitable. The oxen or horses will trample down a few plants, cutworms will get some more, rodents will take their toll, and certain grains will not grow. All these factors cannot be entirely eliminated, but there may also be mechanical inefficiency in the planter. This implement should be overhauled at the end of every planting season. Worn parts must be replaced, and everything cleaned, adjusted, oiled and made ready for the following season. If fertilizer hoppers, for example, are not thoroughly cleaned, the working parts will become rusted together and delays and breakages will result during the ensuing season.

It seems obvious then that the rate of seeding must also be increased to offset the losses due to the various factors mentioned above. Plant the crop more thickly; it is easy to remove surplus plants at the time of hand-weeding when they have done little harm.

Since the labour involved in obtaining a 50 per cent. stand is practically the same as for a 100 per cent. stand, more attention to efficiency will double the return without any appreciable increase in the production costs up to this stage.

Varieties.

Another sphere in which efficiency in production can be raised is in the use of better varieties of the crops grown. Should a variety of maize, for example, be unduly subject to leaf scorch (*Helminthosporium*) in some seasons, efficiency would eliminate that particular variety. Greater efficiency in the use of seed would also include the testing of seed for germination, vigour and viability. There should be no delayed germination of seeds because seeds which germinate several days after the main germination produce weak plants which are seldom worth anything.

Alternate Husbandry.

The constant cultivation of the same crop on the same field year after year over a long cycle of years is very inefficient soil husbandry and is the cause of South Africa's greatest national problem, namely, soil erosion. Exhausted arable lands must be seeded or planted to pastures until the virgin crumb structure of the soil is rebuilt under a grass sward.

It is waste of land and time, however, to allow "lands" to revert to grass by themselves. They should be sown where seed is procurable or planted with roots where seed cannot be secured. Efficient handling of these pastures will prove that they are just as profitable as most arable crops, and in addition have the advantage that they improve the structure of the soil, thereby making the cultivation of other crops possible for many generations to come.

Fertilizer and Pastures.

Efficiency on the farm can also be raised in respect of the amount and kind of fertilizer to be appiled and the point of application relative to the seed. The well-informed farmer will know that pasture grasses have most need of nitrogen, whilst grain crops call largely for phosphates. Efficient pasture management therefore includes correct fertilizing with nitrogenous fertilizers, besides rotative grazing. Continuous grazing is ruinous to good pastures. In the past there has been a tendency to look only to the effect of the pasture on livestock, little attention being given to the effect of stock on the pasture.

Efficiency can also be increased in the use of pastures. It is very bad management, for example, to put 2-gallon cows and 4-gallon cows on the same piece of pasturage. If the pasture can meet the grazing requirements of the 4-gallon cow, then each 2-gallon cow is using the pasture to only 50 per cent. of its efficiency. Conversely, if the pasture can only meet the needs of the 2-gallon cow, then the 4-gallon cow must have her efficiency reduced by nearly 50 per cent., and, obviously, poorer producers or non-producers lower the efficiency still further.

It is very important, therefore, that the farmer should balance his livestock's producton with the food which he supplies to them.

There are places on the farm for working oxen and places for cows in production, places for young calves and dry cows, places for 2-year-old heifers, places for ewes and lambs and mares and foals, and so on. Efficiency in the handling of all these classes of livestock connotes that they will not all be run together in one pasture field at the same time.

Too often are the cows in a dairy herd all treated alike, whether they be newly calved and in their most intensive production period, or whether they be almost dry. The highest producer is usually penalized the most. Seldom is she managed to promote her highest production. It is obvious, therefore, that more attention should be given to increasing the efficiency of the high-producing animal.

Haystacks.

There is often very considerable waste on the farm because the haystacks are not properly built. Not only is there very great wastage at the bottom of the stack, because the good hay is just dumped on the ground instead of on a prepared stack foundation, but livestock are allowed to burrow into the stack, pull the hay out and trample and foul it with dung and urine. Another mistake made in stacking hay is that the stacker builds the hay around himself, leaving a hole. When he climbs out of the hay this hole cannot be properly filled, with the result that the stack cannot be thatched and rain pours down into the hole, causing the hay to rot down through the stack.

Bags.

Another respect in which there is serious wastage on the farm is in the use of bags. The present scarcity may make farmers more careful about bags, but it is doubtful whether the effect will be lasting. When bags are emptied they should be shaken clean, and carefully piled where rodents cannot gnaw holes in them. Any broken or torn bags should be set aside to be repaired on rainy days, when labour can be profitably employed under cover.

How many farmers wash their fertilizer bags, use the waste water for vegetables, lawns or other purposes and have clean wholesome bags again for farm crops?

The list of places where efficiency on the farm can be increased could be greatly lengthened, but the few instances enumerated above should suffice to show where improvements can be effected. May it be stated in conclusion that an efficient farmer soon inspires his labourers to become more efficient themselves.

A Service Crush for Pigs.

**P. L. Kotze, Lecturer in Animal Husbandry and D. L. Greeff,
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ALTHOUGH in pig-farming the object of proper feeding and management is to maintain vigour and activity in breeding boars, yelts and sows, it nevertheless often happens under the best of conditions that the yelt or sow is unable to bear the weight of the boar. The yelt may be too young or the sow too old or for some reason or another too weak and the boar too heavy or lazy. In such circumstances the breeder needs some device for assisting the mating process, not to perpetuate shortcomings, but rather to obtain, under unfavourable conditions, the maximum advantage from valuable breeding animals.

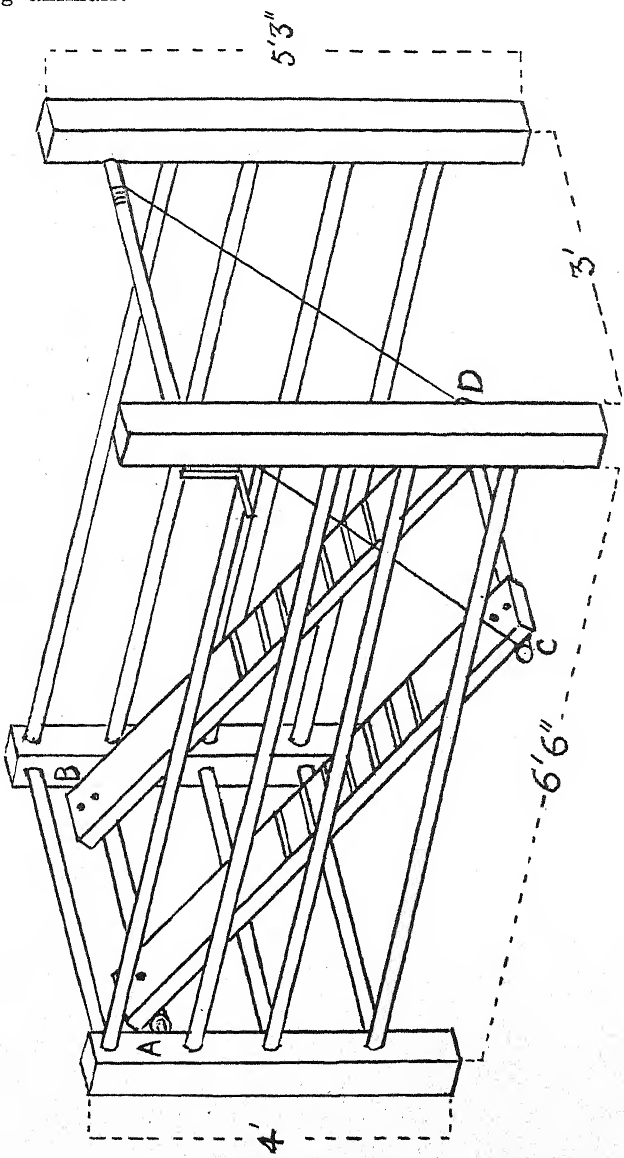


Fig. 1.—Illustration of service crush.

At the Glen College of Agriculture a service crush is being used for this purpose. This crush consists mainly of a frame provided with platforms on the inside of the two sides. The sow stands within this framework and the boar rests its front legs on the platforms. The outside framework measures 6 feet 6 inches in length, 3 feet in breadth and 4 feet in height. At this Institution rails were used for corner posts and 2-inch pipes for the sides but any other suitable material such as wire and 4-inch posts for the corners may be used. For the sake of firmness it will in any case be advisable to embed at least the four corner posts in concrete. The handling of the animals will be facilitated if a funnel-shaped enclosure gives access to the crush.

The platforms consist of two strong parallel boards (AC and BD), each measuring 6 feet in length and approximately 6 inches in width, attached to two iron cross-bars (AB and CD) each about 2 feet 9 inches long. The distance between the two boards varies according to the width of the sow and they should be attached in such a way as to ensure easy shifting. For this purpose hook screws may be used or else a number of holes may be drilled through the iron cross-bars, so that the boards may be fixed at the required distances by bolts.

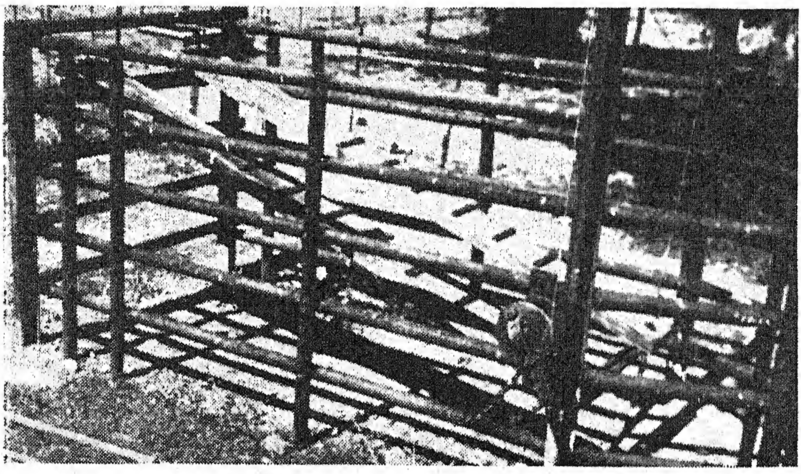


FIG. 2.—A sectional view of the service crush.

At a height of about 3 feet 3 inches above the ground (i.e. about 9 inches from the top) the iron cross-bar is hooked to the closed side or front of the crush, which makes the platform about 3 feet 6 inches high at AB. The back of the platform must be capable of free up and down movements, which requires the attachment of a few hinges, but hinges are usually not enough. It is more serviceable to use for the iron bar AB a 2-inch pipe which can rotate at the point indicated, e.g. on a thinner pipe which has been pushed through the 2-inch pipe and firmly attached on both sides to the corner posts of the crush. The platform boards must be clamped to such a pipe.

In order to fix the back, CD, of the platform at the desired height according to the size of the sow, three alternative methods may be applied:

(*a*) the iron cross-bar CD may be supported on both sides by chains attached to the nearest corner posts;

(*b*) the chains may be replaced by thin cable wire running on both sides over pulleys (at least 4 feet 6 inches high) and leading to a hand crank on one side;

(*c*) the cable wires may be wound by means of an ordinary windlass fixed at the minimum height mentioned. In the latter two cases two short chains may be attached above and below the crank handle on the outside of the corner post for hooking the handle so that the platform may be held at the desired height.

Fig. 3.—The service crush seen from above.

When the sow is brought into the crush, the platform is lifted, and then dropped behind the animal. She then stands in the space between the boards. If she is calm, the boards may be shifted to rest against her flanks; otherwise her width will have to be measured beforehand and the platform adjusted accordingly. The boar supports his forelegs on the boards and thus carries the major portion of his weight himself. Unless precautions are taken, the legs almost invariably slip either backwards or inwards. In order to prevent the former eventuality, flat strips of wood may be nailed cross-wise on to the platform at short intervals, and in the latter case it is important that the boards should touch the flanks of the sow firmly otherwise the boar may entangle a front foot and even seriously injure it.

The sow usually tends to move backwards and consequently the iron cross-bar should be adjusted at such a height as to prevent the sow from stumbling over it or the boar from performing his service. To prevent injury to the animals the bar, if flat, should be adjusted to have the flat side vertical and not horizontal. It is best, however, to use a thin piece of iron with a rectangular or, better still, a circular cross-section.

The above specifications should be suitable for a variety of circumstances and for sows of different sizes. When utilizing the service crush it is most important to have regard to the height of the platform at AB and to ensure that the front feet of the boar will not slip in between the boards and the sow. The length of the platform allows the sow a little moving space to the front in case she is still unwilling. Personal supervision is necessary in case anything should go wrong. A gate at the closed end or front of the service crush may be useful.

The Mango in South Africa:—

[*Continued from page 530.*

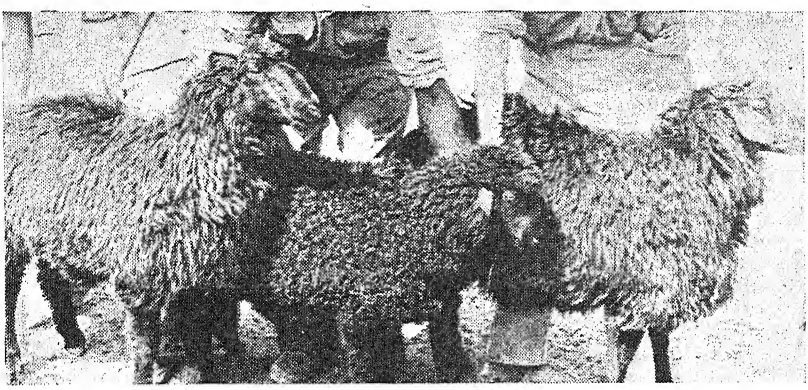
growth. Ploughing should be avoided in preference to discing on account of possible root damage to the trees and the formation of harmful plough-soles resulting over a period of years.

Smudging.—The 'smudging' or 'smoking' of the trees to induce early flowering has become a recognized practice of mango growing in the Philippines. In Java, certain varieties are very shy bloomers, and here also 'smudging' induces normal blossoming. Smoke fires of green and dried grass, trash, etc., are kept burning day and night for up to three weeks in the orchard and the flowers emerge in from 8 to 24 days from the start of the smoke fires. Fruit on smudged trees ripens several months before that of untreated trees, so that if the treatment is to succeed in South Africa it would have to be commenced approximately in March-April. Tentative trials with smudging were made in the eastern Transvaal several years ago, but no response was obtained. This practice may open the possibility of spreading the season during which ripe mangoes will be available for marketing.

The Inheritance of Size of Ear in Karakul Sheep.

D. J. Louw, Lecturer in Sheep and Wool, Grootfontein College of Agriculture, Middelburg, Cape.

As a rule, purebred karakul sheep have long, large ears, 5 to 6 inches in length and $2\frac{1}{4}$ to 3 inches in width. The ears stand away from the head, giving the animal a very attractive appearance. Some karakul sheep, however, have short ears, from $2\frac{1}{2}$ to 3 inches in length and about $1\frac{1}{2}$ inches in width, ending in a sharp point. Ears of this type tend to hang down and are often referred to as mouse ears. There is, however, a third type of sheep with no external ears except short stubs close to the head. This type is classified as earless. A karakul lamb has even been found with a stub on one side of the head and no sign of any external ear on the other side.



Earless, short-eared and long-eared karakul sheep.

Importance of Ears.

The size of ear is of no economic importance, but the important point is whether or not the animals have ears. The stubs of the earless type are so short and fleshy that it is impossible to affix an ear tag or to earmark them.

In the case of karakul sheep, more than with any other animal, it is absolutely essential to keep a careful record since the fullgrown animal is sold or appraised according to the photo of the sheep as a new-born lamb. For this reason it is essential that every sheep should have an identification mark. If the sheep has no ears, the only alternative is to attach an ear tag to a wire round its neck. There are many disadvantages attached to this method. As the neck grows thicker, the wire must constantly be lengthened to obviate strangling. Moreover, the wire is liable to chafe the animal.

Of the 7 earless lambs dealt with in this investigation, two were born with one ear completely uncovered by any hair or skin. In course of time, however, these wounds healed completely and were covered by the skin. This type of abnormality was found only in the case of earless lambs.

A further disadvantage of earlessness is the fact that earless sheep have a very unattractive appearance.

For the above-mentioned reasons it is therefore undesirable to breed the earless type of karakul sheep. In order to obviate earlessness, however, it is necessary to determine how size of ear is inherited.

According to experiments* carried out in America, it was found that the progeny of long-eared sheep mated with earless sheep, had short ears. If short-eared sheep are mated, the progeny will be long-eared, short-eared and earless. Although only a very small number of sheep was handled, the conclusion was reached that size of ear is determined by a single pair of factors and that the short ear characteristic is the heterozygotic condition which never breeds true.

The following results were obtained from an analysis of a number of karakul lambs born at the Grootfontein College of Agriculture:—

	Long-eared.	*Short-eared.*	*Earless.*
93 Long × Long	93	0	0
109 Long × Short	54	55	0
26 Short × Short	4	15	7
1 Short × Short	0	1	0

According to the above-mentioned theory, these results may be explained as follows. If *LL* represents long ears and *ll* represents earless, short ears will be represented by *Ll*. The above matings may then be explained as follows:—

Long × Long, or $LL \times LL = LL$.
Long × Short, or $LL \times Ll = 1\ LL : 1\ Ll$.
Short × Short, or $Ll \times Ll = 1\ LL : 2Ll : 1\ ll$.
Short × Earless, or $Ll \times ll = 1\ Ll : 1\ ll$.

The results therefore correspond absolutely to the theory except that the proportion of the progeny of the short x short mating shows a small deviation. Statistically this deviation is also significant ($P<0{\cdot}50$). It may, however, be ascribed to the fact that the numbers of animals included in the investigation were too small.

One very important fact was clearly proved, however, viz. that earless sheep occur when short-eared rams are used with short-eared ewes. These rams should, therefore, not be used for breeding purposes.

Owing to the shortage of serviceable rams in South Africa, it is practically impossible to eliminate short-eared karakul sheep completely. The use of these rams should, however, be avoided as far as possible.

* "Karakul Sheep" by Lush, Jones and Dickson. Pam. No. 405 Texas Experiment Station.

Planning for Protein.

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ALL feeding-stuffs are composed of moisture, protein, carbohydrate, fats or oils, crude fibre, and mineral matter or ash, in varying proportions. These constituents do not, however, all have the same value in the rations of livestock, the proteins and mineral matter being of great importance in the feeding of farm animals, but unfortunately they are the very ones so often lacking in livestock rations.

The proteins, commonly referred to as the flesh-forming constituents of the rations, contain, among other things, nitrogen. Growing animals and cows in milk require a considerable amount of protein in their rations. Moreover, no other constituent in the ration can adequately take the place of the protein. The fact that there might be an abundance, or even an excess, of one or more of the other constituents in the ration does not compensate for any shortage of protein. Hence, in the case of the dairy cow, if there is any deficiency of protein in her feed, her milk production will be adversely affected, and will drop. A lack of protein is frequently a limiting factor in so far as milk production is concerned, and as long as this condition lasts, cows will not be able to reach or maintain their maximum yield of milk.

It is no exaggeration to say that the majority of milk cows in the Union do not receive sufficient protein in their rations to enable them to reach their maximum yields. An insufficency of protein is one of the principal causes for the low average yields of milk.

Protein Supplements.

Blood meal, fish meal, carcase meal, and oil cakes are some of the feeding-stuffs which contain the most protein. Unfortunately all the above supplements are in very short supply at present, and as for any improvement in the situation, matters do not look very encouraging or hopeful at the moment. In other words, the farmer will have to depend more upon his own resources, and less upon outside supplies for his protein requirements.

The problem of the farmer is to obtain an adequate supply of protein in order to balance the rations of his livestock. Owing to the shortage of protein-rich supplements, the balancing of rations has become a difficult problem, more particularly for those who were accustomed to buying all their protein supplements in the form of oil cake, carcase meal, eac.

Augmenting Supplies.

The question now arises: "What can be done to augment the meagre supplies of available protein?" The answer to this question lies in the production of leguminous crops. This is the most economical means of making provision for the protein requirements of the various classes of livestock. By careful planning it will be possible, in most cases, to increase the protein supply of the farm, and to make the farm much more self-sufficient in this respect.

Protein is generally the most expensive item in the rations of livestock, and so, in the interests of economical feeding, farmers should endeavour to produce as much of this necessary nutrient as

possible. In many cases it may be possible to produce all the required protein on the farm, and in others, a large proportion of the requirements can be home-grown.

Most of the common farm-produced crops, such as maize, teff or veld hay and silage, are relatively low in their protein content. Consequently rations consisting largely of such feeding-stuffs do not provide sufficient protein for the animals' needs. In other words, if livestock are entirely dependent on these feeds, then their rations will be unbalanced, and particularly so in the case of milk cows and growing stock. Livestock on farms where no legumes are produced, or where no protein-rich supplements are purchased, will, in most cases, not be getting an adequate supply of protein in their rations, i.e. their rations will not be balanced.

In addition to the various legumes, such as soyabeans, cowpeas, lucerne, peanuts, velvet beans, etc., other sources of protein are the oil-bearing seeds, sunflowers and linseed.

Legume hay is particularly valuable livestock feed, because, in addition to the fact that it has a relatively high protein content, it is also fairly rich in minerals, and the usual supply of mineral matter is also in short supply at present. So the legume hays provide two very essential and important constituents in the ration.

Fifteen pounds of high quality cowpea hay can provide sufficient protein for the maintenance of a medium-sized cow and the production of about 2—2½ gallons of milk. This means that if one has an adequate supply of good legume hay on hand, a medium producing herd can get all its protein requirements from this source.

Soyabean seed is very rich in protein, containing about 36 per cent. This figure is higher than that of certain oil cakes. Soyabean seed should, of course, be ground before feeding. It is not very palatable, but if it is introduced into the ration gradually, cows will soon consume fairly large amounts. Cows can be induced to eat it more readily if it is mixed with, say, molasses.

In order to provide an adequate quantity of legume hay for the dairy herd during the winter months, about one ton per head is required—that is feeding at the rate of 10 to 15 pounds per cow per day.

In the rapidly growing stage, grass is rich in protein, and during this period will provide farm animals with most of their protein requirements. More protein can be conserved by converting surplus grass into silage, rather than allowing it to mature on the veld.

As far as the making of veld hay is concerned, a great deal of protein is lost because the grass is cut too late, and consequently the hay has a much lower feeding value. Cutting the veld at the right stage may make all the difference between a hay with a protein content of about 12 per cent. and one containing only about 3 per cent.

By careful planning it will be possible, in most cases, to increase the protein supply on the farm very considerably. Livestock farmers should therefore look well ahead, and plan to grow most, if not all, of their protein requirements during the next planting season. A concerted effort by all concerned will do much towards augmenting the available supplies of protein, and thus avoiding an otherwise acute protein shortage.

The Farm Home.

(A section devoted mainly to the interests of Farm Women.)

The Dress Form.

Elma du Preez, Home Economics Officer, Department of Agriculture.

ANYONE making her own clothes knows how difficult it is to fit a frock on oneself. Nor is it always possible to obtain assistance. A dress form solves this problem and can be made at a small cost to fit the figure. Material can be draped, cut and fitted on such a form, with excellent results.

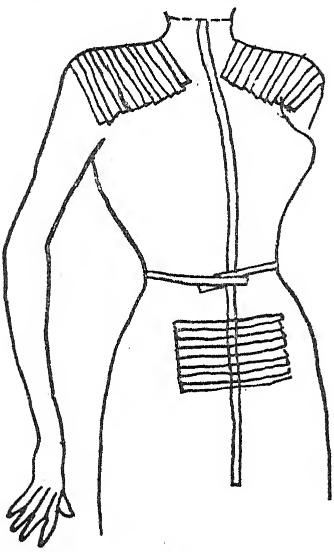

FIG. 1 (a).—One strip down centre front; strips round waist, stomach strips, shoulder strips.

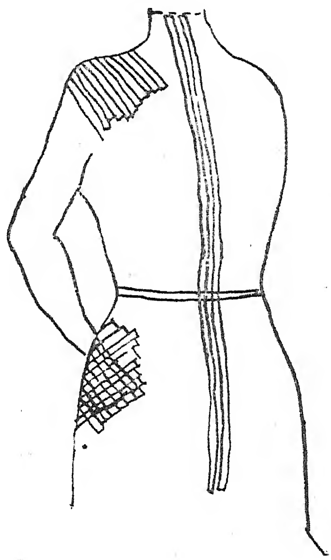

FIG. 1 (b).—Back, hip strips, two strips down centre back.

The form gives one the opportunity of surveying the figure objectively to decide which lines suit the figure best, how good points can be accentuated and defects made less conspicious.

Requirements.

(1) 2 cheap well-fitting, short-sleeved, high-necked vests.

(2) 5 yards of black tape, about $\frac{1}{4}$-inch wide.

(3) $1\frac{1}{2}$ rolls of thick gummed paper, about 1-inch wide (obtainable from stationers).

(4) A piece of thick cardboard or thin board, about 12 in. by 18 in., or larger for a stout person.

(5) About a $\frac{1}{4}$ pint of mixed shellac.

(6) A few sponges or old rags in saucers of water, a dish and a towel, a pair of scissors, a sharp knife, needles, strong cotton, 4 safety-pins, a tape measure, pencil, long ruler or straight rod and newspapers.

Choose a warm, dry day on which to make the form, and work in an airy room so as to minimize the discomfort suffered by the person acting as model. The model should be feeling fit that day. She should be wearing closely fitting underclothes. For instance, if she wears a corset, she should put on one which fits well and neatly. She should put on a pair of old stockings and comfortable

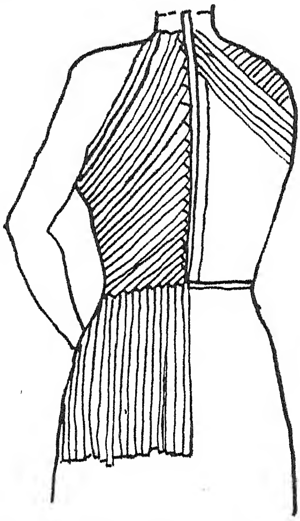

FIG. 2.—Hip layer; first back layer.

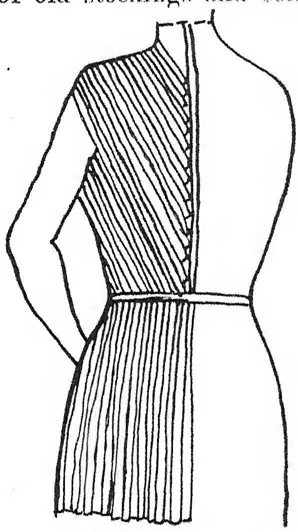

FIG. 3.—Hip strips; second back layer.

shoes with comfortable heels and would be well-advised to wear an old petticoat, in case of damage. The first thing for the model to do is to don one of the vests over the petticoat. If it does not fit the figure smoothly, the extra fullness should be smoothed away by means of darts. The neck is buttoned up high and an extra piece, which can be cut away from the sleeve, or a strip of cheesecloth, is inserted round the neck in such a way that the material stands up smoothly against the neck.

The vest is now pulled well down and pinned to the garters or suspenders with safety-pins. Pin the vest from the inside so that the paper is not pasted over the pins. The figure is now ready for pasting. The model should stand naturally and erect while the pasting is being carried out.

While the model is being dressed someone else can be preparing the paper strips. First cut the following strips:—

3 strips of about 27 inches each, 1 strip, the diameter plus 3 inches.

Now hold the rest of the roll erect and using a sharp knife, cut through the side to the centre at one spot. In this way strips of different lengths are obtained, suitable for pasting over various parts of the body.

The Pasting of the Model.

Three people can paste simultaneously. Special persons for moistening the strips, will facilitate and speed up the process considerably. Paste as follows:—

(1) One 27-inch strip is pasted down the exact centre front from the hollow of the throat.

(2) The other two 27-inch strips are pasted down the centre back, about a ¼-inch apart.

(3) The fourth strip is pasted round the waist, following the exact natural line, with the ends overlapping slightly in front on the stomach, as shown in the diagram (Fig. 1A).

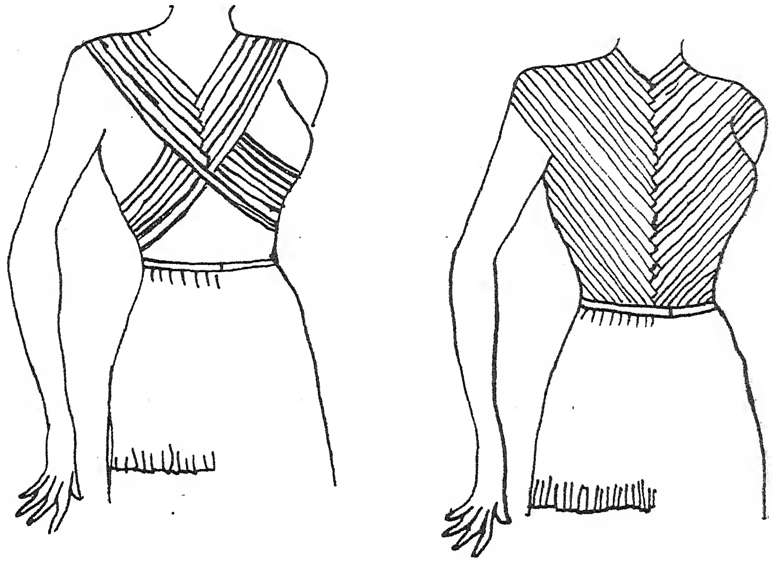

FIG. 4.—Bust, pasted over with a few strips, and completed bust.

(4) Six to eight strips are pasted over the stomach to keep it in position. See that all the strips overlap well. The hips and shoulders can now be pasted simultaneously.

(5) *The shoulder strips.*—Beginning from the neck paste two layers of strips up to the shoulder joint, as illustrated in Figure 1.

(6) *The hips.*—Strips of about 12-14 inches are pasted straight down from the waist with the edges overlapping well. Start from the centre front and centre back and work round to the sides (Fig. 2). Round the hips a second layer, just like the first is pasted over the first layer, to give firmness.

If the dress form is being made for a stouter person, it is desirable to slant the strips round the hips (Fig. 1B), in order to obtain the curve of the hip more easily.

(7) *The Back.*—Start pasting from the neck at the centre of the back and slant the strips down to a position high up under the arm. Continue on both sides of the back till the whole back is covered. Be careful, however, not to paste over the ¼-inch space between the two strips down the length of the back. Now paste a second layer over the back, this time with the strips running from the shoulders and slanting from the underarm to the middle of the back (Fig. 3).

(8) *The Bust.*—Start from the neck with the first few strips and let the strips slant over the bust to the underarm (Fig. 4). The first strip should run over the hollow of the throat. Now a strip is pasted in the same way from the other side (left) of the neck to the right underarm, so that the strips cross.

The strips are now pasted alternately from the two sides so as to interlace. When the bust is reached, however, another method is followed. Starting well below the left arm under the bust, draw the

strip diagonally across up to a point under the right arm, lifting and flattening the bust in the process, as would have been the case had the pasting been started from the top. Now work from the bottom up, interlacing the strips in the same way, till the whole bust is covered (Fig. 4).

(9) *The Neck.*—For the neck, 4-inch strips, slit lengthwise for about an inch at the bottom, are used. Starting under the chin, paste the strips straight down so that the slit end falls on the bust.

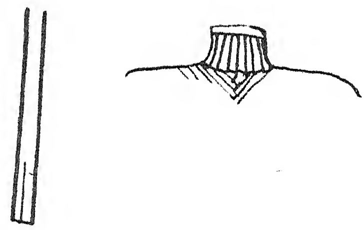

FIG. 5.—Strip for neck with ½-inch slit; neck pasted.

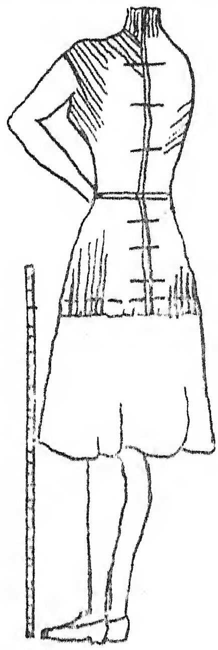

FIG. 6.—Hip line is measured; diagonal-lines.

Now run these strips round the neck with each one again overlapping on the one before. A double layer is again pasted on. Paste one strip round the top of the neck to keep the strips in position (Fig. 5).

The Marking and Removal of the Form.

Measure the distance from the broadest part of the hips to the floor and mark the form at that height all round (Fig. 6). Make a note of the height from the floor.

Now draw diagonal lines across the back of the form over the open ¼-inch space (Fig. 6). Take the waist, bust and hip measurements and note them down.

Now cut the form open along the ¼-inch space at the back, cutting through the vest, and carefully remove the form. Handle carefully so as to make as few dents or creases as possible and press into shape again, where necessary.

Comparison of the measurements of the form with those of the model should not reveal a discrepancy of more than ½ an inch to 1 inch. If desired, this difference may be rectified by pushing the form together slightly at the back.

As soon as the form is removed from the model the open space at the back is pasted over with cross-strips of about 4 to 6 inches. See that the diagonal lines drawn across the back, as in Fig. 8, correspond exactly.

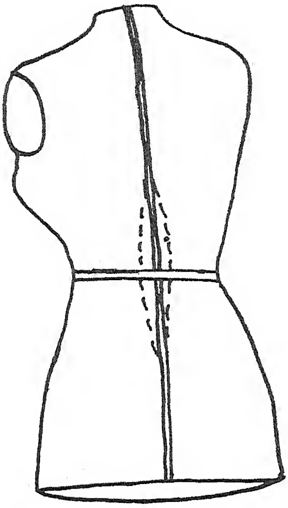

FIG. 7.—How the form is taken in at the waist.

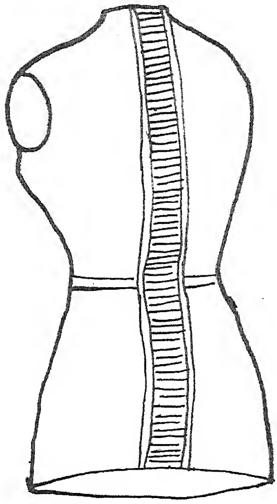

FIG. 8.—Back pasted.

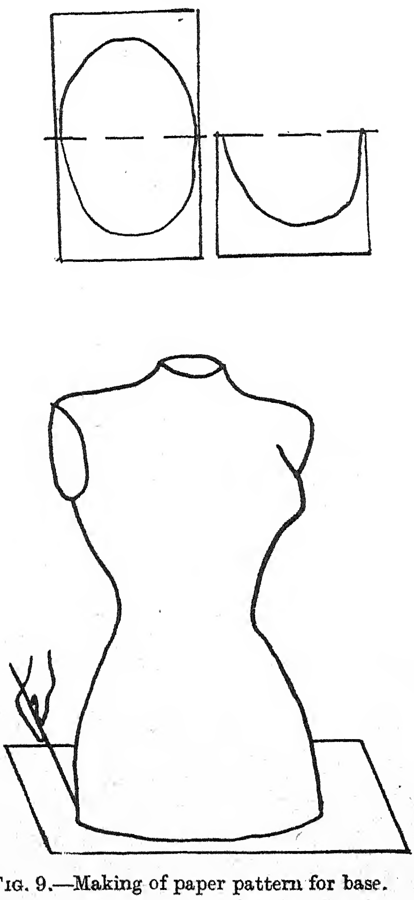

FIG. 9.—Making of paper pattern for base.

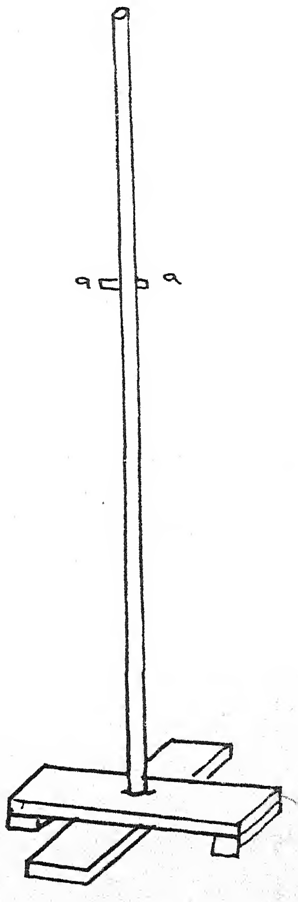

FIG. 10.—Stand for the form.

Now level out the armholes and neck, and also the base of the form according to the marks made around the broadest part of the hips.

Next, the edges of the armholes, neck and base are finished off neatly and firmly with strips pasted from the outside over the edge to the inside, with the edge of the one overlapping that of the one before. The whole inner surface is now pasted over with paper, completely hiding the vest. Now allow the form to dry thoroughly.

Reinforcement with Thin Cardboard and Shellac.

Now place the form on a sheet of paper and trace the outline as shown in Fig. 9. Mark the centre front and back and cut out. See if the paper fits into the form and then cut it out in fibreboard or thick cardboard. Strips of cardboard are cut out in exactly the same way to fit into the neck and armholes.

Make a round hole, about 1 inch in diameter, in the neckpiece. Now fit both the neckpiece and the base into the form and then drop a little ink straight from the hole in the neckpiece on to the base and, taking the inkspot as the centre, make a round hole also about 1 inch in diameter in the base. These holes are necessary for fitting the form to a stand.

All the pieces of cardboard are then fitted in and pasted down with 4-inch strips on the outside. The armholes are left open till last, in order that access may be gained through them for pasting down the neckpiece and base.

The whole form is then painted with shellac. If the paper with which the form has been pasted is fairly thin, a second coating of shellac may be given. Allow to dry thoroughly.

Final Finishing Touches.

Put the second vest on to the form. Close the neck up high by inserting a piece of the sleeve round the neck. Gather the material in so that it fits firmly round the neck, but see that the hole is left open.

Cut away superfluous material and sew the armholes up neatly. Finish off the base in the same way as the neck.

Next, the various lines are marked on the form by sewing black tape, about a ¼-inch wide, along the armholes, shoulder line, neck line, underarm line, hip line, and waist line as well as on the lines at the centre front and back

Stand for the Form.

Any round straight rod can be used for the stand, e.g. a broomstick which fits into the holes in the form. A cross board on which to rest the form should be provided so that the form will be the same height as the person for whom it is made (Fig. 10).

Crops and Markets

A Statistical and Economic Review of South African Agriculture

by

The Division of Economics and Markets

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CONTENTS

Price Review for April 1947.*

Fruit.—Except for pineapples and bananas, which were well supplied, the supply of sub-tropical fruit was moderate and the demand generally keen. Firm prices were generally maintained by large quantities of apples. Limited supplies of pears, grapes, guavas and citrus fruits were sold at favourable prices. Good quantities of quinces and spanspeks were available, but owing to the inferior quality they drew little attention.

Tomatoes.—This section was generally well supplied and prices showed a rising tendency.

Onions.—Moderate supplies reached the market. The demand was keen and prices increased.

Potatoes.—Large quantities of potatoes were delivered but the demand was moderate and prices remained firm. The demand for supplies of sweet potatoes was weak.

Vegetables.—Pumpkin varieties, leaf vegetables and green beans were available in excessive quantities, and prices eased. Good supplies of beetroot and cucumbers sold fairly well. Carrot offerings were generally good and prices remained firm at a high level. Green peas were scarce and expensive.

Grain and Fodder.—Arrivals of lucerne hay could not meet the demand. Dry beans were better supplied than dry peas; the latter fetching high prices.

Eggs and Poultry.—Small consignments of eggs made only fair sales, sellers ascribing the position to the high prices. Poultry was well supplied and generally sold well.

* All prices mentioned are averages.

Index of Prices of Field Crops and Pastoral Products.

THE above index, which appears elsewhere in this issue, increased from 203 during the previous month to 205 in April 1947.

The most important changes occurred in the following groups:—

(*a*) "Hay" increased from 154 to 176 due to a further increase in the prices of lucerne.

(*b*) "Other Field Crops", i.e. potatoes, onions, sweet potatoes and dry beans increased from 158 to 165, particularly as a result of an increase in the prices of onions and dry beans.

(*c*) "Poultry and Poultry Products" show an increase from 251 during the previous month to 282 owing to a further increase in the prices of eggs.

Agricultural Conditions in the Union during April, 1947.

Weather Conditions.—Scattered, light showers of rain occurred in all four provinces, but the eastern parts of the country from the Transvaal highveld and north-eastern Orange Free State and Natal, as far as the Transkei, experienced particularly good rains. Severe droughts, however, still prevailed in the western and nothern Transvaal, north-western Cape Province and in the south-western Orange Free State.

Crops.—In the north-western Orange Free State, the lowveld and highveld of Transvaal, as well as in the Transkei and Natal, the prospects for summer cereal crops were very promising, while in the northern Transvaal, western Transvaal and southern Orange Free State rain was urgently needed.

Stock and Pastures.—The condition of stock was generally fair. In the north-western Cape Province, south-western Orange Free State and northern Transvaal, however, farmers have already suffered stock losses, and some have had to trek with their stock to areas with better grazing. Except for lumpy skin disease which still occurred in the western and south-western Cape Province, and for lumpy skin disease and nagana in Natal, stock diseases in general were quiet.

Review of the Wool Market during April 1947.

During April 1947 a total of 41,888 bales of wool was offered for sale at auction in Union harbours, and 30,193 bales (73 per cent.) were sold. This quantity was less than that offered in March 1947, while the prices for April were on a higher level than those of March.

Sales were generally steady and there was a brisk demand on the markets for all free wool, short wool and lambs' wool. Karoo and grassveld wools were well represented, and kaffir wool sold well. The demand for karakul wool was weak. At the end of the month buyers were generally more discriminating and cautious.

Prices and Winter Premiums of Dairy Products 1946/47 Season.

As a result of the abnormally poor conditions which prevailed in 1946 and the appreciable increase in costs, particularly of feedstuffs, the basic price of butterfat was increased by 1d. per lb. to 2s. 2d., 2s. and 1s. 10d. per lb. for 1st, 2nd and 3rd grade butterfat, respectively as from 1 November 1946, and cheese milk by ½d. per gallon to 11¼d. (or 2s. 7½d. per lb. butterfat contained therein), while the usual 1d. per gallon difference between the producer's price of condensing milk and cheese milk in favour of condensing milk was also maintained, i.e. the producer's price for condensing milk was fixed at 12¼d. per gallon (or 2s. 10d. per lb butterfat).

The output of butter and cheese has nevertheless continued to decline and in order to encourage the producers to make an additional effort to provide winter feed and maintain the production of dairy produce during the coming winter, it has been decided to increase the winter premiums on butterfat and cheese milk substantially and to increase the producer's price of condensing milk correspondingly.

The winter premium on butterfat will be increased by 3d. per lb. and will therefore be 7d. per lb. during June 1947 and 9d. per lb. from 1 July to 31 October 1947. The winter premium on cheese milk will be increased by 1d. per gallon and will thus be 3d. per gallon during June 1947 (or 8¼d. per lb. butterfat) and 3½d. per gallon (or 9¾d. per lb. butterfat) from 1 July to 31 October 1947.

The price of condensing milk has accordingly been fixed at 1s. 3¼d. per gallon (or 3s. 6½d. per lb. butterfat contained therein) for June 1947 and 1s. 3¾d. per gallon (or 3s. 7¾d. per lb. butterfat) as from 1 July to 31 October 1947.

Maxium Prices of Oat Hay.

THE maximum prices of oat hay as fixed on 11 January 1946 (see *Crops and Markets* of March 1946) have now been slightly amended.

The maximum producer's price of unbaled and baled oat hay remains unchanged at 4s. 6d. and 5s. 3d. per 100 lb., respectively, free-on-rail seller's station.

In the case of resale, 9d. per 100 lb. may be added to the abovementioned price, plus railage and 1d. per 100 lb. per mile transport cost.

In the case of cut oat hay (in bags or baled) the maximum price at which the manufacturer may sell, is raised to 8s., 7s. and 2s. 9d. per 100 lb. for first, second and under second grade, respectively. Wholesale prices are raised to 9s., 8s. and 3s. 9d. per 100lb. respectively, plus railage and transport costs at 1d. per 100 lb. per mile which may be added to the above price.

(See *Government Gazette Extraordinary* of 9 May 1947.)

The Marketing of the 1946/47 Maize Crop.

THE following prices (per 200 lb.) to producers have been fixed for maize as from 1st May, 1947:—

	Grades 2, 4 and 6.	Grades 3, 5 and 7.	Grade 8.
	s. d.	s. d.	s. d.
In bags	21 3	21 1	20 10
In elevators	20 0	19 10	19 7
In bulk at depots of storage agents	19 7	19 5	19 2

The above prices are free-on-rail senders' station.

These prices are based on 2s. each for new grain bags at which price bags will be stabilized by the Government. The corresponding prices at which grades 2, 4 and 6 of maize were fixed for the previous season were 22s. 6d. per 200 lb. in bags, and 21s. 2d. per 200 lb. in elevators.

Last year an advance price of 20s. per bag was announced for the present maize crop. There is, however, an increase in costs of about 3d. per bag in the price of bags, while increased labour costs in harvesting and threshing are estimated at 1s. per bag, so that the bagged price was increased to 21s. 3d. for the coming season.

The minimum price of seed maize has been fixed at 21s. 3d. per bag.

During the past season a consumer's subsidy of 5s. per bag was paid by the Government. This was made possible by the permit system then in operation, otherwise the large difference between producer and consumer prices would have resulted in a temptation for producers to sell all their maize and buy their own requirements back again at the lower price. The permit system prevented such a practice from developing. This year, with more maize available, the permit system has been withdrawn and it was therefore necessary to adjust prices in such a way that producers' selling prices do not exceed their buying prices by an appreciable amount. The selling prices to consumers have thus been increased by 1s. 7d. per bag to 20s. 3d. per bag for maize in bulk, with the bagged price to the producer at 21s. 3d. To cover this difference of 1s. between the Maize Board's buying and selling prices, as well as the cost of storage of maize (which will be high this year on account of the lack of bags and the necessity to improvise bulk storage), the Government will still be required to pay a subsidy of 3s. 1½d. per bag.

Furthermore a subsidy of 1s. per bag (of 200 lb.) of mealies milled will be paid to millers, while the miller's levy has also been reduced from 4d. to ¾d. per bag. Although the Board's selling price for maize has thus been increased by 1s. 7d. per bag, it was possible to increase the consumer's price of milled maize products by only about 4d. per bag for the present season.

(See *Government Gazette Extraordinary* of 2 May, 1947.)

Prices of Slaughter Stock for the 1947/48 Season.

Prices of Slaughter Cattle.—Prices of slaughter cattle in the controlled areas for the coming season will remain unchanged except that the seasonal increase in prices will be raised from 15s. to 17s. 6d. per 100 lb. dressed weight, while the seasonal increase in the prices of grade 4 beef will be only 12s. 6d. per 100 lb.

To offset the expenditure connected with the higher seasonal prices, the basic producers' prices will be reduced by 1s. per 100 lb. as from 12 May 1947. In the case of Cape Town, however where in the past basic prices were 1s. per 100 lb. more than for the Witwatersrand area, the basic prices are now reduced by 2s. to bring it into line with that in the Witwatersrand area, seeing that the offal prices in these two areas are now on the same level. The prices of beef cattle in the Durban-Pietermaritzburg area are, in comparison with those of the Witwatersrand area, also increased by 1s. per 100 lb. so that prices there are now only 2s. instead of 3s. lower than in the Witwatesrand area. This has been done to attract larger supplies to the Durban-Pietermaritzburg area. It has also been found that a premium of 1s. 6d. per 100 lb. above prices in the Witwatersrand area has been necessary to attract adequate supplies to Pretoria, and prices in the latter area were raised accordingly. Over and above the seasonal increase of 17s. 6d. per 100 lb., producer prices in the Cape Town, Durban and Pietermaritzburg areas will be increased by a further 2s. per 100 lb. as from November onwards to 19s. 6d., and in the case of grade 4 to 14s. 6d. The seasonal increase commences as from 15 June, with 1s. per 100 lb. rise per week, and reaches the peak about the beginning of November. For Durban and Pietermaritzburg, the seasonal increase, however, commences a week earlier, viz. on 8 June. In spite of these changes in producers' prices, consumers' prices will remain unchanged.

Sheep and Goat Prices.—Slaughterings of sheep, goats and lambs declined considerably since 1941 because of the decline in the small-stock numbers. An increase, especially in the sheep population of the Union, is thus desirable. For that reason the Government decided to raise the producers' prices of lamb and of super, prime and grade 1 mutton and grade 1 goats' meat by an average of 1d. per lb. dressed weight. Since certain adjustments in prices between the different controlled areas were necessary to ensure a more even distribution of supplies between these areas, the actual increase in producers' prices will be as follows.—Cape Town, 1¼d. per lb; Witwatersrand, Pretoria, Durban and Pietermaritzburg, 1d. per lb; and Port Elizabeth, East London, Kimberley and Bloemfontein, ¾d. per pound.

For grade 2 goats' meat and mutton which are consumed largely by the lower income groups, the price increase to producers will be ½d. per pound for all areas, except for Cape Town where it will be ¾d. per pound.

This price increase will take effect from 9 May 1947 and will cause a slight increase in consumers' prices.

Prices of Pigs.—Pig production decreased considerably during the past season because of a shortage of feeds. With the improvement in the feedstuff position it is, however, also desirable to encourage the expansion of pig production in order to supplement the meat supply of the country, particularly as it can be done in a comparatively short period. Because of this, producers' prices of grade 1

and 2 porkers were raised by 1d. per lb. dressed weight and that of sausage pigs and larders by ½d. per lb. The increase in the prices of pigs takes effect as from 12 May, 1947.

(See *Extraordinary Government Gazette* of 9 May 1947.)

The new basic prices of slaughter stock for the 1947-48 season are given in the following table.

	Cape Town.	Durban and Pieter-maritzburg.	Pretoria.	Witwaters-rand.	East London, Bloemfontein, Port Elizabeth, Kimberley.
	s. d.	s. d.	s. d.	s. d.	s. d.
Calves per lb.—					
Grade I	0 8	0 8	0 8	0 8	0 8
Grade II	0 6	0 6	0 6	0 6	0 6
Pigs per lb.—					
Suckers, super	1 3¼	1 3¼	1 3¼	1 3¼	1 3¼
Porkers Grade I	1 0¼	1 0¼	1 0¼	1 0¼	1 0¼
Porkers Grade II	0 11	0 11	0 11	0 11	0 11
Baconers Grade I	1 3	1 3	1 3	1 3	1 3
Baconers Grade II	1 0½	1 0½	1 0½	1 0½	1 0½
Sausage pigs	0 9½	0 9½	0 9½	0 9½	0 9½
Larders	0 8¼	0 8¼	0 8¼	0 8¼	0 8¼
Roughs	0 6	0 6	0 6	0 6	0 6
Undergrade pigs	0 3½	0 3½	0 3½	0 3½	0 3½
Cattle per 100 lb.—					
Super	66 0	64 0	67 6	66 0	63 0
Prime	57 0	55 0	58 6	57 0	54 0
Grade I	49 0	47 0	50 6	49 0	46 0
Grade II	42 0	40 0	43 6	42 0	39 0
Grade III	35 0	33 0	36 6	35 0	32 0
Grade IV	21 0	19 0	22 6	21 0	18 0
Lambs per lb.—					
Super	1 1½	1 1¾	1 1½	1 1¼	1 0¾
Prime	1 0	1 0¾	1 0½	1 0¼	1 11½
Grade I	0 11¼	1 0	0 11¾	0 11½	0 10¾
Sheep per lb.—					
Super	0 11½	1 0¼	1 0	0 11¾	0 11
Prime	0 10½	0 11¼	0 11	0 10¾	0 10
Grade I	0 9¾	0 10½	0 10¼	0 10	0 9¼
Grade II	0 7¼	0 8	0 7¾	0 7½	0 7
Goats per lb.—					
Grade I	0 8¾	0 9	0 8½	0 8½	0 7¾
Grade II	0 6¾	0 7	0 6½	0 6½	0 6½

Average Prices of Onions and Sweet Potatoes on Municipal Markets.

SEASON (1 July to 30 June).	ONIONS (120 lb.).						Sweet Potatoes. (120 lb.).		
	Johannesburg.		Cape Town.	Pretoria.	Durban.				
	Trans-vaal.	Cape.	Cape.	Cape.	Local.	Cape.	Johannes-burg. Table.	Durban.	Cape Town.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938–39	8 3	8 10	7 4	7 10	8 6	9 6	5 7	4 8	5 3
1939–40	6 3	9 10	7 3	9 11	9 8	10 5	5 7	5 9	5 0
1940–41	12 5	12 3	9 10	11 11	11 2	12 7	7 3	6 4	5 5
1941–42	10 5	13 11	10 4	13 10	13 0	14 3	9 10	7 1	8 4
1942–43	13 8	14 0	12 6	14 7	12 9	14 5	9 8	8 1	8 5
1943–44	16 2	18 9	15 1	17 4	19 1	19 2	12 0	10 9	10 7
1944–45	14 7	18 7	14 8	18 1	18 8	19 5	17 3	15 1	16 3
1946—									
January	12 0	12 1	9 7	—	11 7	13 0	17 1	15 6	17 3
February	12 3	13 8	11 1	13 1	15 2	9 11	17 3	10 3	17 2
March	11 4	12 4	9 9	12 10	12 9	13 5	18 5	14 8	14 8
April	12 1	12 10	11 3	13 10	15 1	14 9	15 2	17 4	14 7
May	13 6	13 9	11 9	13 9	12 10	14 7	15 8	15 6	14 5
June	14 7	15 5	12 2	17 1	15 11	14 11	14 11	14 8	16 1
July	11 10	14 3	12 0	15 0	15 2	15 6	15 2	15 2	17 4
August	14 9	17 0	13 7	15 10	20 6	18 7	16 10	16 0	18 3
September	20 9	25 3	20 4	23 2	21 5	23 3	20 0	16 5	22 11
October	24 9	28 1	32 5	24 0	32 3	31 8	24 6	16 9	20 10
November	21 11	—	26 11	—	24 8	21 1	23 10	15 1	20 8
December	16 8	15 2	12 4	—	19 8	19 6	18 11	11 11	25 5
1947—									
January	14 9	14 0	11 5	14 10	15 6	14 3	16 6	9 6	19 8
February	14 8	14 5	11 9	13 7	16 1	17 8	16 11	7 6	18 11
March	17 6	18 7	14 3	20 3	13 4	17 6	15 6	13 4	16 1
April	20 7	22 2	18 0	22 3	24 11	24 4	12 7	8 4	10 11

Index of Prices of Field Crops and Animal Products.

(Basic period 1936-37 to 1938-39 = 100.)

SEASON (1 July to 30 June).	Summer cereals. (a)	Winter cereals. (b)	Hay. (c)	Other field crops. (d)	Pastoral products. (e)	Dairy products. (f)	Slaughter stock. (g)	Poultry and poultry products. (h)	Combined index.
WEIGHTS.	19	13	2	3	34	6	17	6	100
1938-39	92	109	96	89	79	102	106	94	93
1939-40	86	114	77	95	115	105	106	89	104
1940-41	108	120	106	156	102	108	110	103	109
1941-42	120	144	143	203	102	131	135	136	124
1942-43	160	157	144	159	122	147	168	167	147
1943-44	170	186	137	212	122	154	185	188	159
1944-45	183	186	160	281	122	177	179	184	164
1945-46	201	194	164	312	118	198	185	170	170
1946—									
January	198	194	191	347	118	204	188	204	174
February	198	194	158	305	118	186	184	224	171
March	198	194	160	280	118	186	181	241	171
April	198	194	176	298	118	186	180	279	174
May	249	194	170	284	119	186	177	289	184
June	246	194	178	287	119	218	178	260	184
July	245	194	182	303	120	231	183	193	182
August	242	194	181	319	120	231	188	164	181
September	243	194	183	351	163	231	196	156	198
October	240	194	166	365	171	231	204	155	201
November	240	210	165	309	179	194	208	171	204
December	242	210	157	236	168	194	208	201	200
1947—									
January	242	210	144	174	178	194	200	238	202
February	240	210	127	157	187	194	191	248	203
March	240	210	154	158	189	194	182	251	203
April	239	210	176	165	190	194	182	282	205

(a) Maize and kaffircorn.
(b) Wheat, oats and rye.
(c) Lucerne and teff hay.
(d) Potatoes, sweet potatoes, onions and dried beans.
(e) Wool, mohair, hides and skins.
(f) Butterfat, cheese milk and condensing milk.
(g) Cattle, sheep and pigs.
(h) Fowls, turkeys and eggs.

Average Prices of Lucerne, Teff, Kaffircorn and Dry Beans.

SEASON AND MONTH (b).	LUCERNE (per 100 lb.).			Teff Johannesburg (a) 100 lb.	KAFFIRCORN in bags (200 lb.).		DRY BEANS (200 lb.) bags.		
	Johannesburg (a).		Cape Town 1st grade.		F.o.r. producers' stations.		Johannesburg (a).		
	Cape.	Transvaal.			K1.	K2.	Speckled Sugar.	Cow-peas.	Kidney.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
1938-39	3 10	3 1	4 0	2 7	13 1	12 9	25 0	16 9	24 2
1939-40	3 0	2 5	3 4	2 6	8 8	9 4	21 11	13 11	21 2
1940-41	4 2	3 5	4 3	3 3	15 6	17 0	30 0	16 8	27 11
1941-42	5 7	5 2	5 8	4 7	18 10	19 6	32 10	19 8	28 3
1942-43	5 5	6 0	7 4	5 5	24 10	24 10	34 0	25 8	24 2
1943-44	5 4	5 6	7 3	4 5	21 0	21 7	49 6	29 11	32 1
1944-45	6 4	5 4	7 2	4 9	18 8	18 8	88 7	39 6	70 6
1946—									
January	7 6	—	8 1	5 9	20 6	20 6	103 4	68 6	75 4
February	6 0	5 10	8 1	5 9	20 6	20 6	90 8	69 3	69 4
March	6 2	5 3	7 4	5 4	20 6	20 6	86 8	61 11	63 7
April	7 0	5 6	7 4	4 11	20 6	20 6	91 4	51 0	74 3
May	6 10	5 1	7 6	4 6	69 11	69 11	90 6	52 11	75 7
June	7 3	5 6	7 6	4 5	60 8	60 8	84 2	45 9	66 1
July	7 5	6 9	7 3	4 5	57 10	57 10	81 8	45 1	67 7
August	7 5	4 8	7 3	4 3	48 5	48 5	69 11	41 1	61 7
September	7 6	7 0	7 3	4 4	50 0	50 0	73 0	40 4	61 11
October	6 9	4 11	6 9	4 1	40 3	40 3	69 2	34 5	56 6
November	6 9	5 10	7 2	3 11	40 10	40 10	61 4	35 3	59 10
December	6 3	5 6	7 3	4 5	48 8	48 8	70 2	36 6	52 11
1947—									
January	5 10	5 11	7 5	3 8	48 9	48 9	61 4	38 11	51 4
February	5 0	4 10	7 5	3 11	40 11	40 11	44 3	33 6	44 3
March	6 3	5 10	7 5	3 11	40 8	40 8	47 1	35 1	49 3
April	7 1	6 10	7 8	4 7	38 4	38 4	55 7	42 3	56 1

(a) Municipal Market.
(b) Seasonal year for kaffircorn, 1 June–31 May. Dry Beans, 1 April–31 March; Lucerne and teff, 1 July–June.

Index of Prices Paid for Farming Requisites.

Year and Month.	Implements. (*a*)	Fertilizers. (*b*)	Fuel. (*c*)	Bags. (*d*)	Feeds. (*e*)	Fencing Material. (*f*)	Dips and Sprays. (*g*)	Building Material. (*h*)
Basis—								
1936–38...	100	100	100	100	100	100	100	100
1942......	123	157	140	206	136	229	117	168
1943......	144	171	154	237	152	239	127	179
1944......	161	184	156	307	155	240	134	184
1945—								
January...	159	204	156	310	162	225	136	181
April......	159	204	156	311	163	224	136	181
July.......	159	204	156	321	169	225	135	180
October....	159	204	146	321	166	225	135	179
1946—								
January...	155	204	146	314	168	218	135	174
April......	152	204	146	304	163	213	134	174
July.......	152	199	130	308	167	214	134	176
Oct.	153	199	131	308	163	215	134	177
1947—								
January...	163	199	131	325	166	216	134	184
April... (*j*.)	164	199	123	325	172	217	137	186

The following is the composition of the above groups. (The items are weighted according to their respective inportance) :—

(*a*) Ploughs, planters, seed-drills, harrows, cultivators, ridgers, mowers, binders, hay rakes, silage cutters, hammer mills, separators, windmills, shares, land sides, mouldboards, mowers, knives, pitmans, guards.

(*b*) Superphosphate, ammonium sulphate, muriate of potash.

(*c*) Petrol, power paraffin, crude oil, grease, lubricating oil.

(*d*) Woolpacks, grain bags, sail twine, binder twine.

(*e*) Mealies, oats, lucerne, groundnut oil-cake meal, bonemeal, salt.

(*f*) Fencing wire, standards, baling wire.

(*g*) Bordeaux mixture, lime sulphur, arsenate of lead, cyanogas, Cooper's sheep dip Little's dip, Tixol cattle dip.

(*h*) Corrugated iron, deals, cement, lime, flooring boards.

(*j*) Preliminary.

PRINTED IN THE UNION OF SOUTH AFRICA BY THE GOVERNMENT PRINTER, PRETORIA

CONTENTS

G.P.-S.2232—1947-8—7,950.

Information on Departmental Publications.

Farming in South Africa, the monthly journal of the Department, contains popular as as well as scientific articles on a variety of agricultural topics, useful to both the farmer and the housewife, while the Crops and Markets Section supplies information on crop prospects, market prices and exports of agricultural produce.

The following particulars in regard to subscriptions and advertisements should be noted :—

Subscription.—Within the Union, South West Africa, Bechuanaland Protectorate, Southern Rhodesia, Swaziland, Basutoland, Mocambique, Angola, Belgian Congo, and British Territories in Africa, 5s. (otherwise 7s. 6d.) per annum, post free, payable in advance.

Applications, with subscriptions, to be sent to the Government Printer, Bosman Street, Pretoria.

Advertisements.—The Tariff for Classified Advertisements is: 2d. (two pence) a word with a minimum of 5s. per advertisement (prepaid). Repeats, not entailing any change in the wording, will be published at half the cost of the original.

Conditions:

(1) The advertisement will be classified under specific headings, and only one black letter (initial letter) is permitted.

(2) Advertisements in which prices are mentioned must contain the name and address of the advertiser. A nom-de-plume or box number only is not sufficient, and unless this condition is strictly observed, advertisements will not be accepted.

(3) Advertisements will be classified strictly in accordance with the subject-matter of the announcement, determined by the first item mentioned and cannot be inserted under irrelevant headings.

(4) Displayed, classified advertisements will also be accepted. The charge, however, will be 10s. per inch, single column, per insertion, without reduction for repeats.

Copy for Advertisements to be in the hands of the Government Printer, Pretoria, not later than the 20th of the month preceding publication.

Send all advertisements direct to the Government Printer, or write to him for details as to tariff for advertisements.

Popular Bulletins.—Bulletins on various agricultural topics are published by the Department to meet public demand. A list of available bulletins giving particulars of cost, etc., is obtainable free of charge from the Editor, Department of Agriculture, Pretoria.

Scientific Publications.—From time to time the different Divisions of the Department issue science bulletins incorporating the results of research work conducted by them. Other scientific publications issued are: "The Onderstepoort Journal", "Memoirs of the Botanical Survey of South Africa", "Bothalia", "Entomological Memoirs" and the "Annual Reports of the Low Temperature Research Institute". Information in regard to these publications is obtainable from the Editor, Department of Agriculture, Pretoria.

Press Service.—The Press of South Africa is now supplied with a bulletin of agricultural information for their exclusive use. This information is supplied to all newspapers and other journals throughout the country.

Farmer's Radio Service.—In addition to the printed information supplied by the Department to members of the farming community, the Department, in collaboration with the South African Broadcasting Corporation, also has a national broadcasting service for farmers. Information in regard to times of broadcasting is contained in the programmes issued by the Broadcasting Corporation.

Inquiries.—All general inquiries in regard to the above should be addressed to the Editor Department of Agriculture, Pretoria.

D. J. SEYMORE, Editor.

FARMING IN SOUTH ... AFRICA

VOL. 22 JULY 1947 No. 256.

Editorial:

Increased Food Production Through Fertilization.

IT is clear that with the country's increased purchasing power as well as the fertilizer shortage of the past few years, the farmer in South Africa finds it increasingly difficult to meet the nation's food requirements. The pre-war days of surplus production are a thing of the past and to-day the South African representatives are also queueing up where the world's basic food is being distributed oversea. During the past year attempts have been made to import not only wheat, supplies of which have always been inadequate, but also oil seeds, oils, meat and maize. Furthermore, land must also be made available for the production of fibres for the manufacture of bags.

The industrial development accompanying the expansion of the coal, gold and steel industries means that so many more workers will be prepared to pay for their food. It is the farmer's business to provide this food and a judicious approach will redound both to his own advantage and to that of his country.

The time has come to make plans for the coming summer and the profitable use of fertilizers is an important weapon in the struggle for higher and more profitable food production.

The country's fertilizer requirements—especially her phosphate requirements—have doubled since 1940. Although the supply is still inadequate, there has been a noticeable improvement and the government is leaving no stone unturned to make good this shortage. The problem with which we are faced, however, is how to utilize the available supplies in the most effective manner and certain principles learnt from experience must therefore be borne in mind.

It would be out of place at this stage to argue about the merits of organic fertilizers as opposed to those of artificial fertilizers. Both are scarce and farmers should help themselves as far as possible by making compost.

Phosphatic fertilizer is excellent under dryland conditions and is eminently suitable for crops such as maize and groundnuts. In damper areas 300-400 lb. of super phosphates (if available) per morgen are recommended and 200 lb. for the drier parts. It has repeatedly been proved that in large portions of the country, maize can be successfully cultivated year after year if properly fertilized with superphosphates. The grain yield is easily increased by 10—20 per cent. and this means at least an extra 2,000,000 bags of maize for the granaries of the country.

Where fertilizer was applied during the past summer, some legume such as cowpeas, groundnuts or soybeans may be planted this year. These crops will all be able to benefit considerably from the residual affect of last year's application of supers. There is a

world shortage of oils and unless sufficient quantities of oil-bearing seeds are produced, there will be a shortage of edible oils as well as oil paint and soap, to say nothing of the valuable seed cake meal so essential to dairy cattle.

The sources in China and India have suddenly dried up and while there is a food shortage in those countries, we should produce our own oil plants as far as possible.

Heavily fertilized soils for the recent large potato crop, may now be used unfertilized for other crops in order that the maximum benefit may be derived from the residual effect of the fertilizers. It is also useful to bear in mind that the higher the productive capacity of the soil, the more profitable heavy applications of fertilizer will be. Holland and Belgium which have some of the most fertile soils in Europe, use more fertilizer in proportion to their area than less fertile areas. This principle may also be applied in South Africa on valuable soils under irrigation. It has been proved at Vaalhartz that it is very profitable to use as much as 1,200 lb. super per morgen annually for lucerne. To-day the price of lucerne is high and more lucerne means more food in the form of eggs and dairy and meat products. Moreover, the farmer who cultivates lucerne, renders his soil a service. Practically any crop may be cultivated unfertilized on an old lucerne land ploughed again, provided that the lucerne was well fertilized. The cultivation of lucerne on drylands, especially in the Orange Free State and the western Cape Province is a very popular practice and the soil should receive a heavy application of super phosphates shortly before the crop is sown. In addition, agricultural lime is essential to the successful cultivation of this crop, especially on acid soils where the rainfall is favourable.

Nitrogenous fertilizers are used mainly for sugar cane, fruit and vegetables and for wheat in the western Cape Province. Maize shows practically no response to this plant food and nitrogen is too expensive to be wasted in this way. It is much better to save it for wheat or for top dressing of vegetables. tobacco or fruit trees.

Fruit and vegetable farmers who use large quantities of kraal and Karroo manure annually, must think of the future; fertilizer will undoubtedly play a larger rôle in their future farming practices. The fertilizer shortage since 1941 has expedited the exploitation of manure to such an extent that at present the South African Railways transport almost 400,000 tons annually to the most important food producing areas. The question arises as to how long the supply will be able to keep pace with this enormous consumption. Manure, the fertilizer accumulated for many years, is now being taken from kraals throughout the country and at this rate it will be impossible to keep up the supply indefinitely. The farmer should therefore supplement the available fertilizers with phosphatic fertilizer in order to ensure good crops with half the quantity of Karroo manure. Animal fertilizers are relatively rich in nitrogen but poor in phosphates and heavy applications therefore result in the wastage of much of the former expensive constituent.

The use of ground Karroo manure for maize is not recommended since an application of as much as 800 lb. per morgen cannot provide sufficient phosphates to the plant and, in addition, most of the nitrogen is wasted. For the same amount the farmer can buy 75 per cent. more fertility in the form of crude manure.

Potash supplies are kept for tobacco, potato and fruit farmers and the cheapest source of potash to-day is to be found in Karroo manure which contains almost 5 per cent. potash in the dry material.

 [Continued on page 570

Classification of Skins.

THE Hide and Skin Committee of the Livestock and Meat Industries Control Board has, in consultation with interested parties in the hide and skin trade, fixed the following grades for all the controlled centres, which will come into operation on 1 July 1947.

Merinos.

Combings:—All merino skins derived from sheep slaughtered at the controlled abattoirs with a minimum length of 2 in. and over.

Longs:—Same as above but with a length of 1½ in.-2 in.

Mediums:—Same as above with a length of 1 in.-1½ in.

Shorts:—Same as above but with a length of ½ in.-1 in.

Pelts:—Same as above but with a length of up to ½ in.

Close Shorn or *White Shorn* are pelts that are newly shorn.

The average length of the wool on a skin should indicate the grade. For example, if the wool on the skin is from 2 to 3 inches in length, the grade is a *Combing Skin*; if the length varies from 1½ to 2½ inches, the indicated grade is a long-wool skin. The minimum average length therefore indicates the grade.

The wool of all merino skins must show definite merino characteristics. Spinning count and quality should not be taken into consideration in the grading of merino skins.

Coarse and Coloureds.

The Coarse and Coloured grades shall contain all skins of cross-bred sheep (Merino × English breeds), purebred English breeds such as English long and short-wool breeds, Merino × Africander (or Persian), English breeds × Africander (or Persian) and Karakul × Africander. All sheep skins not conforming to the Glover or Merino types should be graded into this line. Black merinos or coloured wool skins are also classed in these grades. *On no account must close-shorn Coarse and Coloured be classed as Merino Close Shorn.*

Karakul Skins.—These are skins derived from the purebred karakul sheep. The number of karakul skins received at the controlled centres is very small and the bulk of the so-called karakul skins actually consists of Coarse and Coloured because the karakul breeder kills the lambs when a few days old, and the only karakuls received at the abattoirs are old ewes that are unfit for breeding purposes. As there is hardly any difference between the average karakul skin and the Coarse and Coloured, it is suggested *that all karakuls be graded with the Coarse and Coloureds* and be sold at the same price as this grade.

Long:—Coarse and Coloured Skins with a wool length of 1 in. and over.

Short:—Coarse and Coloured Skins with a wool length up to 1 in.

Capes or Glovers.

These may be described as the grade which contains all the hairy and kempy sheep skins. An allowance should be made for a certain quantity of wool on the skin. The following breeds produce this type:—

(1) Africander (Ronderib, Gladdehaar or Blinkhaar and the fat tail).

(2) Blackhead Persian or White Persian.

(3) Persian × Africander.

Large Glovers consist of skins of the above type with a good spread.

Small Glovers are skins of the above type with a poor spread.

(Issued by the Livestock and Meat Industries Control Board.)

Prices Through Three War Periods.

Professor F. R. Tomlinson, Agricultural Research Institute, Pretoria.

DURING the past half century the South African nation has gone through three periods of high prices as a result of wars. It is the purpose of this article to compare the relative increases in prices during these three periods and to compare the movement of agricultural prices with the general wholesale price index as well as with certain groups of retail prices. It is an old saying that history repeats itself, although this is not necessarily true of economic trends. The price trends which followed on the first two wars can, however, serve as an indication of what can be expected sooner or later in the present post-war period. The date of the turning point in the present upward price trend can, however, not be predicted even approximately. There are too many factors involved in the present situation and it is impossible to determine the effect on prices of each of this multitude of factors.

In Fig. 1 the price trends of crops and animal products are represented graphically during three war periods in South Africa, namely the Anglo-Boer War, World War I and World War II (*). In order to compare the relative price increases and declines during separate periods a uniform base is not used throughout; the trend during each war period is compared with its own pre-war base.

TABLE I.—*Index numbers of prices of crops and livestock products* (1) *in South Africa* (2) *during three war periods.*

Anglo-Boer War (3). (1897–1898 = 100.)		World War I (4). (1913–14 = 100.)		World War II (4). (1938–39 = 100.)	
Year.	Index.	Year.	Index.	Year.	Index.
1898	105	1913–14	100	1938–39	100
1899	106	1914–15	98	1939–40	98
1900	114	1915–16	103	1940–41	112
1901	119	1916–17	115	1941–42	135
1902	127	1917–18	123	1942–43	159
1903	138	1918–19	129	1943–44	177
1904	106	1919–20	189	1944–45	185
1905	119	1920–21	161	1945–46	195
1906	99	1921–22	97	1946–47	213 (5)

(1) Excluding prices of wool, mohair, hides and skins.

(2) Prices for the period 1898 to 1906 are only for the Cape Colony and not for the Union of South Africa.

(3) Calculated from *Agricultural production and prices in the Cape Colony*, 1849–1909, *by F. R. Tomlinson*, unpublished manuscript, University of Pretoria.

(4) Prices for the period 1913–14 to 1921–22 and 1938–39 to 1945–46 are taken from Report of the Marketing Council on the Marketing Control Boards, 1938 to 1946, U.G. 27 of 1947, page 4.

(5) Represents average for nine months and obtained from Division of Economics and Markets. Special acknowledgment and appreciation go to Mr. A. J. du Plessis of the Division of Economics and Markets who was responsible for the construction of the combined agricultural price index from 1911 to date.

* This price index excludes prices of wool, mohair, hides and skins and is referred to in this article as the "agricultural price index."

A few outstanding characteristics of the price movements during the three periods can be deduced from the figure. Firstly, each war period brought about a strong price increase. Secondly, the peaks in prices occurred after the cessation of hostilities. Thirdly, prices underwent a sudden decline in the case of the first two war periods. After reaching the peak in 1903, prices declined during the following year to below the pre-war level, then increased again slightly, but declined again to below the pre-war level. In the case of World War I prices, after reaching a peak in 1920, declined within two years to below the pre-war average. It is impossible to predict a similar sudden decline after the peak has been reached in the present post-war period. The possibility of such a decline cannot, however, be ruled out. The fourth important feature of agricultural price movements during the three war periods was that the peak in each case was higher than the previous one. In the case of the Anglo-Boer War the peak was only 38 per cent. above the pre-war average as compared with 89 per cent. in the period of World War I. The most recent available prices indicate that the agricultural price index is 113 per cent. above the pre-war average. This high increase has happened in spite of strong price control measures applied to agriculture since the beginning of the war. Agricultural prices would undoubtedly have soared much higher if no price control measures were applied during the past war.

The above comparisons in the increase of agricultural prices are made with each pre-war period as base for the increase following it,

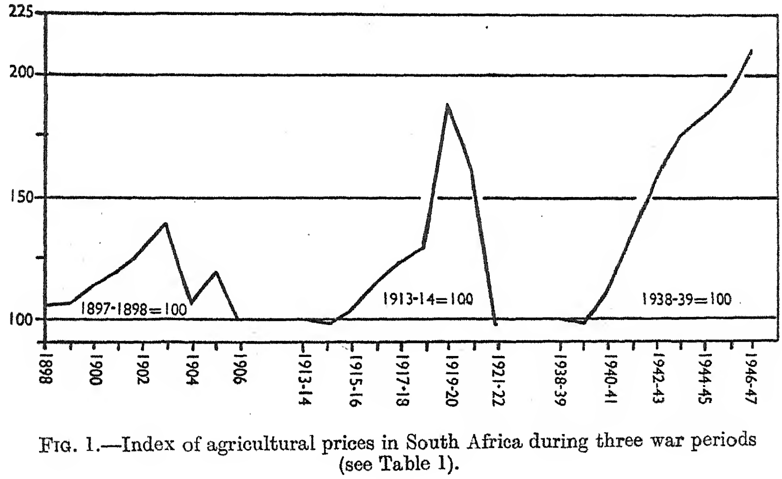


FIG. 1.—Index of agricultural prices in South Africa during three war periods (see Table 1).

e.g. 1913-14 as base for the period of World War I and 1938-39 as base for the period of World War II. In order to compare the actual level of agricultural prices during the two war periods, the same base should be used for both periods. With 1913-14 as base, agricultural prices reached a peak of 189 in 1919-20 (See Table I). On the same base the most recent index (index 213 on base 1938-39, see Table I) comes to 190. The actual level of the agricultural price index used in Figure 1 is therefore at present more or less as high as the peak during the First World War period.

The present high level of agricultural prices has many advantages to producers as long as that high level lasts, but inherently it holds many dangers for the future. Farmers who are perhaps under the impression that the present high level of prices can be maintained

and who make investment plans on the basis of the present level, may expect a great shock in the future. Purchasing of farms at present land values (which are closely tied to the increasing price level) should in general be strongly discouraged. It is a general economic fact that on a downward movement of agricultural prices, farming costs do not move in close relationship with such prices. A large part of agricultural costs is relatively fixed and does not move in relation with the agricultural price level at all. A high farm indebtedness is of all fixed costs the most dangerous at present.

Wholesale Prices.

It has been shown above that during two previous war periods agricultural prices declined to below the pre-war level. The general wholesale price level of all commodities is less elastic. It also declined sharply after World War I, but not as low as agricultural prices.

The index numbers of wholesale prices of all commodities in South Africa are shown in Figure 2 for the periods 1914 to 1922 and 1939 to 1947. During the past war the general price level of all commodities was reasonably kept in check. At present, however,

TABLE II.—*Index numbers of wholesale prices of all products during two war periods in South Africa.*

World War I. (1) (1914 = 100.)		World War II. (2) (1939 = 100.)	
Year.	Index.	Year.	Index.
1914	100	1939	100
1915	110	1940	111
1916	127	1941	122
1917	145	1942	137
1918	158	1943	149
1919	170	1944	154
1920	230	1945	156
1921	166	1946	160
1922	133	1947	163 (3)

(1) Data for period 1914 to 1922 are taken from official year-books of the Union of South Africa and re-calculated to 1914 as base.

(2) Data for period 1939 to 1947 are taken from Monthly Bulletin of Statistics, Office of Census and Statistics, Pretoria, and re-calculated to 1939 as base.

(3) Average for first quarter of 1947.

this index is not far below the 1919 level, but a sharp increase such as that which took place in 1920, has been absent up to the present. The wholesale price index in 1939 was, however, considerably higher than in 1914. If the 1946 level is compared with 1914 as base it stands at an index of 168 in comparison with 170 in 1919. For practical purposes we can therefore assume that the wholesale price index is at present at the same high level as in 1919. The question at present, and one to which no reply can be given, is whether this price index is near its peak.

A comparison between the agricultural price index shown in Figure 1 and the general wholesale price index shown in Figure 2 is important. In comparing the present level of both series of index numbers on the pre-war basis one has to conclude that the agricultural price index is to some extent high in relation to the

wholesale price index of all commodities. The history of prices teaches us that over a long period agricultural prices cannot be out of relation with the general wholesale price index for long. A return of agricultural prices to a level at least in relation with the general price index will therefore have to take place sooner or later.

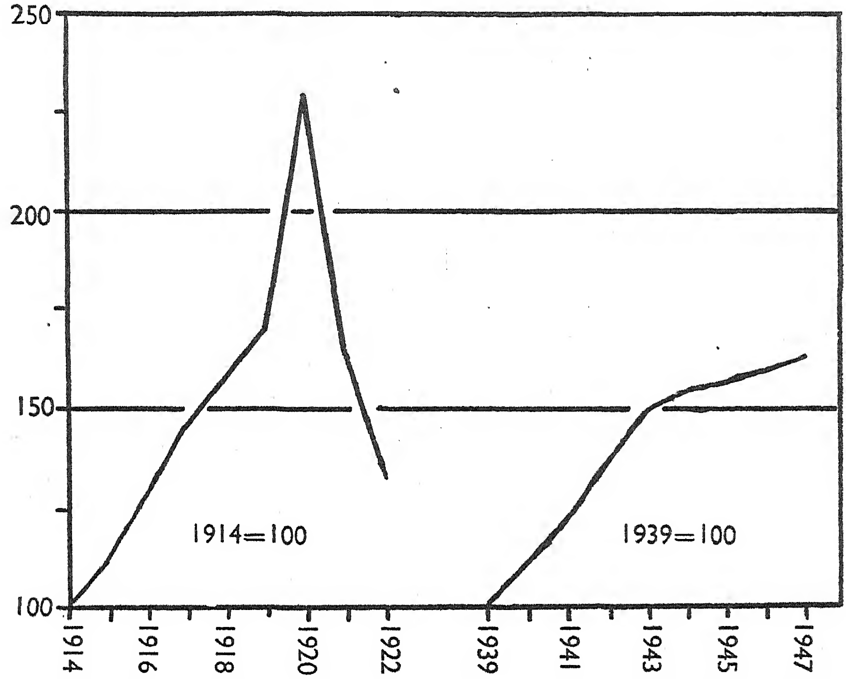


FIG. 2.—Index numbers of wholesale prices of all commodities in South Africa during two war periods. (See Table II.)

Retail Prices.

The consuming public, especially the pensionary, salaried person and wage earner, is interested mainly in retail prices. These prices are, of course, closely related to the general wholesale price index and to the agricultural price index. In Figure 3 are shown the index numbers of retail prices for food, fuel, light and rent, and in Figure 4 the index numbers for food only during three war periods in South Africa..

The index of retail prices (*) in Figure 3 measures the changes in the retail prices of a fixed series of articles and services between certain dates. No allowance is made, however, of changed consumption structures. Consequently these indexes are not indexes of cost of living and should not be interpreted as such. It does, however, remain our best measure of changes in the cost of living. In this analysis we are interested mainly in the trends of retail prices during the three war periods, as well as in the comparison of these trends with trends in the other price series already discussed.

* This index is used and not the index of retail prices which also includes " diverse articles " mainly for two reasons: firstly, because the former index is more reliable prior to 1938 than the latter, and secondly, because it is available for an uninterrupted period since 1895. This index is referred to in this article as the " retail price index ".

TABLE III.—*Index numbers of retail prices of food, fuel, light and rent in South Africa during three war periods.*

Anglo-Boer War (1). (1897–1898 = 100.)		World War I (2). (1914 = 100.)		World War II (3). (1938 = 100.)	
Year.	Index.	Year.	Index.	Year.	Index.
1898	101	1914	100	1938	100
1899	102	1915	103	1939	100
1900	106	1916	106	1940	102
1901	115	1917	114	1941	106
1902	119	1918	118	1942	115
1903	109	1919	126	1943	121
1904	103	1920	155	1944	125
1905	97	1921	137	1945	129
1906	99	1922	121	1946	131
1907	88	1923	120	1947	134 (4)
1908	87	1924	123	April 1947	136·4

(1) Data for the period 1898 to 1908 taken from Official Year-book of the Union of South Africa, No. 6, and re-calculated to 1897–1898 as base. These data are only for six cities and therefore not altogether comparable with the later periods since 1910.

(2) Data for the period 1914 to 1924 taken from New Retail Price Index Numbers, 1938, Special Report No. 127, Office of Census and Statistics, Pretoria, and re-calculated from 1938 as base to 1914 as base. These data are for nine towns.

(3) Data for the period 1938 to 1947 obtained from the Office of Census and Statistics, Pretoria.

(4) Average for first quarter of 1947.

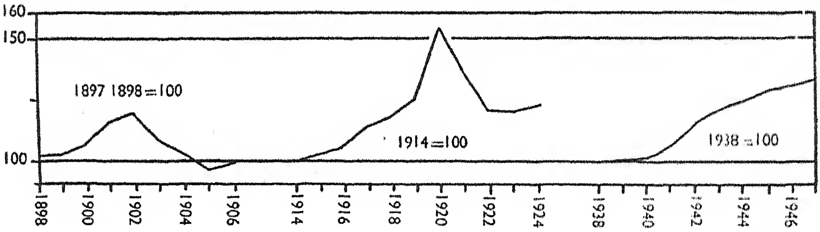


FIG. 3.—Index numbers of retail prices for food, fuel, light and rent during three war periods in South Africa. (See Table III.)

The retail price index shown in Figure 3 increased strongly during the war periods, just as happened in the case of the series shown in Figures 1 and 2, although it did not undergo the same relative increases as either the agricultural price index or the whole-sale price index of all commodities. During the Anglo-Boer War period the retail price index as well as the food price index increased much less than during the First and Second World War periods. Various reasons can be given for this difference in the relative increase between the first war period and the later two war periods, but these are irrelevant in this case.

The retail price index as well as the food price index declined after the Anglo-Boer War to, and even much below, the pre-war average. In the case of World War I both these series declined sharply within two years after reaching the peak, but did not decline to the pre-war average. Even during the worst of the depression in the early thirties the retail price index did not decline to the pre-war average again.

TABLE IV.—*Index numbers of retail prices of food in South Africa during three war periods.*

Anglo-Boer War (1). (1897–1898 = 100.)		World War I (2). (1914 = 100.)		World War II (3). (1938 – 100.)	
Year.	Index.	Year.	Index.	Year.	Index.
1898	101	1914	100	1938	100
1899	102	1915	107	1939	99
1900	102	1916	111	1940	103
1901	112	1917	124	1941	110
1902	111	1918	125	1942	121
1903	104	1919	136	1943	132
1904	97	1920	178	1944	137
1905	94	1921	145	1945	141
1906	89	1922	119	1946	144
1907	88	1923	117	1947	149 (4)
1908	88	1924	120	April 1947	153

(1) For the period 1898 to 1908 data were taken from the Official Year-book of the Union of South Africa, No 6, and converted to 1897–1898 as base. These data apply to only six cities and are therefore not altogether comparable with the later periods subsequent to 1910.

(2) For the period 1914 to 1924 data were taken from New Retail Price Index Numbers, 1938, Special Report No. 127, Office of Census and Statistics, Pretoria, and converted to 1914 as base.

(3) For the period 1938 to 1947 data were obtained from the Office of Census and Statistics, Pretoria.

(4) Average for first quarter of 1947.

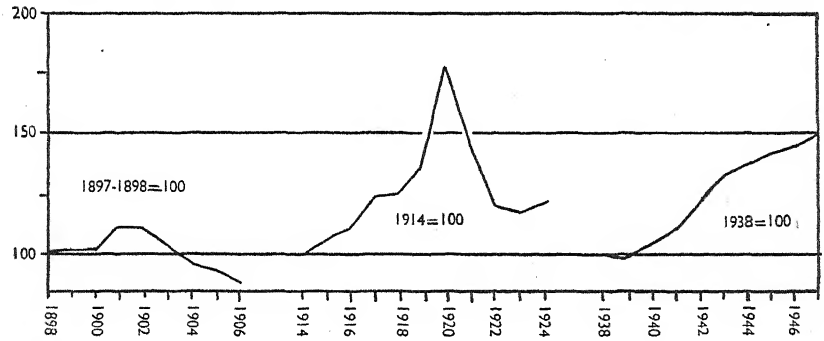


FIG. 4.—Index numbers of retail prices for food during three war periods in South Africa. (See Table IV.)

During the recent war period both the retail price index and the food price index did not undergo the same percentage increase as during the period of World War I. With 1938 as base, the retail price index used in Figure 3 increased to 136 in April 1947, and the food price index to 153. In 1920 and with 1914 as base, these two series reached their peaks of 155 and 178 respectively. The increase in the retail price index since 1938 to April 1947 is, however, considerably more than the increase since 1914 to 1919, the year prior to the peak during that period. The same applies to the increase in the food price index up to the present compared with the increase up to 1919. (Compare data in Tables III and IV.)

The above comparisons of increases in retail prices during the two war periods rest on separate bases, e.g. 1914 as base for the increase in the years following, and 1938 as base for the increase to the present. If the same base is used for both periods, the present level can be compared with the level in the period of World War I.

It has been shown above that the retail price index (Figure 3 and Table III) with 1914 as base, increased to 126 in 1919 and to the peak of 155 in 1920. If the index with 1938 as base is converted to 1914 as base, it stands at 151 in 1946 and 156 in April 1947. Taking 1938 as base for both periods we find the retail price index at 131 for 1946 and 136.4 in April 1947, in comparison with 135.5 for the average of the peak year 1920.

With 1914 as base the food price index increased to 136 in 1919 and to the peak of 178 for the year 1920. On the same base this index increased to 155 in 1946 and 165 in April 1947. Or, on the 1938 base, the food price index stood at 144 in 1946 and 153 in April 1947, in comparison with the peak of 166 in 1920. Thus, as the retail price index for food, fuel, light and rent has already reached the same level as at the peak in 1920, the food price index is still well below the level of 1920. The application of price control measures, coupled with a certain amount of subsidization, contributed much toward retarding the increase in food prices during the recent war period. Had it not been for these two factors, food prices would already have been much higher.

The cost of living level at any point of time is not necessarily a reflection of its pressure on the population as a whole or on the individual as such. The pressure of the cost of living depends on its relationship to the total income of the population or the income (i.e. wage, salary, etc.) of the individual. The severity of the pressure also depends on whether the cost of living is high for a relatively long or a relatively short period.

Rate of Price Increases.

In any comparison of price trends during different periods, it is necessary to compare not only the peaks or low points but also the rate of increase or decrease, in order to obtain a better picture of their effect on the different population groups, whether producers or consumers.

In the case of agricultural prices it has been shown that on a uniform base the present level is approximately the same as the peak of the First World War period, i.e. the average for the year 1919-20. The increase during the First World War was, however, not continuously as sharp as during the past few years. (Compare again the trends during the two periods in Figure 1.) The great increase occurred only in 1919-20, and was followed by a decline in the next year to a lower level, which was, however, still fairly high. During the period of World War I, agricultural prices were therefore very high for only two years at the most. The average agricultural price index during the years 1941-42 to 1945-46 was 170 in comparison with 160 for the five years 1916-17 to 1920-21, a difference of 10 index points. The difference would be much greater if the index for 1946-47 (*) had also been included in the calculation. During the past few years producers have therefore

* The index for the full twelve months is not yet available.

experienced a longer "high-price" period than during the period of the First World War.

More or less the same position is found in connection with the two indexes of retail prices. During the period of World War I retail food prices were, for example, exceedingly high only in 1920. Only in that particular year were food prices higher than they have been since 1944 to date. (These comparisons are not to be inferred form the figures in Table IV.)

A similar position is found in studying the combined index of food, fuel, light and rent. Only during 1920 was this index higher than the level since 1943 to date, whereas in the rest of the period of World War I it was lower.

As a result of the difference in the rate of increase in both agricultural and retail prices during the two war periods, the accumulative effect which both these sets of prices had on producers and consumers respectively differed during the two periods.

Future Level.

The question is so often put as to when the cost of living will decline. This is impossible to forecast because the economist is no prophet. Many people are of the opinion that the Government can at a single stroke decrease prices to the pre-war level. This is absolutely impossible. An intricate network of economic factors is responsible for the present level of prices and it is impossible to undo this network immediately.

The present price level cannot, however, maintain itself indefinitely. A decline must set in sooner or later. Should a decline in the general price structure set in, it can be expected that agricultural prices and the prices of other raw materials will decline faster and further than the general wholesale price index, and especially further than retail prices.

It is definitely doubtful whether the retail price index will decline again to its pre-war level, i.e. the level at approximately 1938 and 1939. After the First World War (with 1914 as base) the retail price index of food, fuel, light and rent declined from 155 in 1920 to 121 in 1922. During the twenties it fluctuated around the 120 level. The average index for the eight years 1922 to 1929 was 122. It did not return to the pre-war level. Even in 1933, during the worst depression which the country has ever experienced, this index did not decline below 108. A return of retail prices during the following few years to the pre-war average seems highly improbable.

Between the price received by the producer, whether farmer or manufacturer, and the price paid by the consumer, i.e. the retail price, there is a whole series of services rendered and consequently costs involved. Many of these costs have meanwhile increased to a higher level and cannot easily be reduced. Wages are one important part of these costs between producer and consumer, and wages are more easily moved upward than downward. The consumer also demands more and better services, factors which therefore all make for a larger margin in the distribution process. In comparison with the pre-war cost level a relatively high cost structure can therefore be expected for a very long time. Greater efficiency in the whole distribution network can, of course, have a declining effect on distribution costs and therefore on retail prices.

Summary.

The purpose of the above analysis has been to compare the trends of agricultural prices, wholesale prices of all products and retail prices during three war periods in South Africa and to determine certain basic differences.

During all three war periods each of the price series underwent large increases. In each case the peak was reached after the cessation of hostilities. In the case of the first two war periods the peaks were followed by drastic price declines.

The relative increase in agricultural prices with each separate pre-war year as base was greater since 1938-39 to date than since 1913-14 to 1919-20. Agricultural prices were, however, slightly lower in 1938-39 than in 1913-14. On one base for both periods the agricultural price index at present is on the same level as the peak in 1919-20.

Agricultural prices are to some extent high, compared with the general wholesale price index. Sooner or later a return of agricultural prices to a level at least in relation with the wholesale price index should take place. Any group of prices cannot for long be out of line with the general price level.

The index numbers of retail prices have not undergone the same percentage increase since 1938 to date as during the First World War period, i.e. from 1914 to 1920. Retail prices were, however, on a somewhat higher level in 1938 than in 1914. If one comparative base is used throughout, the retail price index of food, fuel, light and rent is at present practically as high as the average for the peak year 1920. On a comparable base the retail price index of food in April 1947 was, however, still much below the peak in 1920. Effective control of food prices, coupled with subsidization of basic foodstuffs, retarded the increase in food prices during the recent war period.

After World War I, the retail price index of food, fuel, light and rent did not return to the pre-war level. This index fluctuated for many years around the 120 level. Due to various factors it is improbable that the cost of living will return to the level of just before the recent war.

Increased Food Production Through Fertilization:—

[*Continued from page* 560.

Even under the present conditions of fertilizer shortages and with due consideration of the fact that the price of practically all the principal fertilizers has been doubled since the beginning of the war, the farmer can still, by judicious planning, help to make full use of the available supplies. By more effective methods of production, the conditions giving rise to complaints and criticism from townspeople in connection with subsidies, high prices and the shortage of agricultural products, may be eliminated to a certain extent if the producer does everything in his power to bring down his production costs under the present difficult post-war conditions.

(Dr. E. R. Orchard, Division of Chemical Services.)

The Horse on the Farm.

VII.—Saddlery, Harness and Hitches.

Dr. P. J. v. d. H. Schreuder and F. B. Wright, Senior Professional Officers (Horses).

TO-DAY the riding equipment on many farms consists only too often of some ancient saddle, as like as not with a broken tree, and a bridle mended in various places with wire. This, more than anything else, is indicative of the low position to which the riding horse has fallen in the scheme of farming operations and in the affection of the farmer; for what man who takes a pride in his horses would furnish them with such inferior equipment? Even when the state of affairs is not as bad as that described, many a good horse is spoilt in appearance by being turned out in cheap, clumsy or gaudy saddlery. The object of this article is to give some information on proper saddlery.

The Bridle.

The simpler the bridle, the better. A good horse needs no such artificial aids as coloured browbands, brass rosettes or studded cheek pieces to add to its beauty, and among knowledgeable horsemen such cheap adornments are regarded as being in very poor taste. A neat fit and good quality leather are what the horseman looks for.

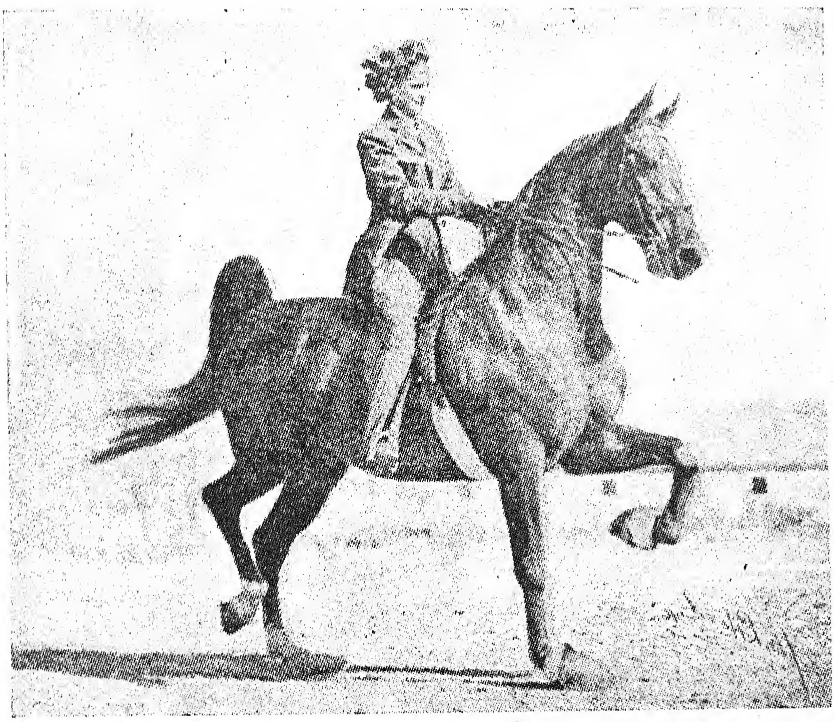


FIG. 1.—An American lass on a U.S.A. Saddler.

Now, if you are a rich man or have only one horse and you want your bridle to look very neat, have the reins sewn on to the bit, likewise the cheek pieces. This does away with all buckles except those needed to adjust the cheek pieces, but as one may for

various reasons wish to hang the bit in a different position in one's horse's mouth, it is as well to have buckles on the cheek pieces so that these adjustments may be made. However, not all of us are wealthy enough to afford a separate bridle for each of our horses, and must therefore fall back on the usual type of adjustable bridle, so that we may change it from one horse to the other. In selecting a bridle, see that it is neatly made of good leather, and that the buckles are not large and clumsy.

A plain leather noseband with separate cheek pieces running through the loops of the browband and over the poll-piece will add to the appearance of a well turned out horse, and is, of course, a necessity where a standing martingale is used. The noseband should not be too narrow— 1¼ in. to 1½ in. is a suitable breadth— and should be adjusted to hang about an inch below the prominent bones on either side of the horse's face.

FIG. 2.—Member of a Capetown riding club on a Thoroughbred.

It will depend on the rider's choice whether he uses one or two reins. Two reins are better in a show ring, but men on farms who spend long hours in the saddle generally do not want to be bothered with more than one rein. They do not ride "at attention" as is expected of show riders, and one rein is quite sufficient for their purpose. But whether one or two reins are used, the leather should be supple and of good quality and not too narrow. Half an inch is an adequate breadth. Some reins are buckled at the middle; others are sewn together. In general one recommends sewn reins for show riding, and buckled reins for veld work, because a horse sometimes gets "hung up in the reins" in the veld when hitched to a tree or left to graze, and it is useful to be able to unbuckle them in the centre.

The nature of the bit will vary with each horse. It is a barbarous procedure to ride a horse in a severe bit if it will go well in a mild one. Factors that make a bit severe are: A thin mouth-piece, a high port, a long shank between mouth-piece and curb rein and between mouth-piece and the attachment of the cheek-piece.

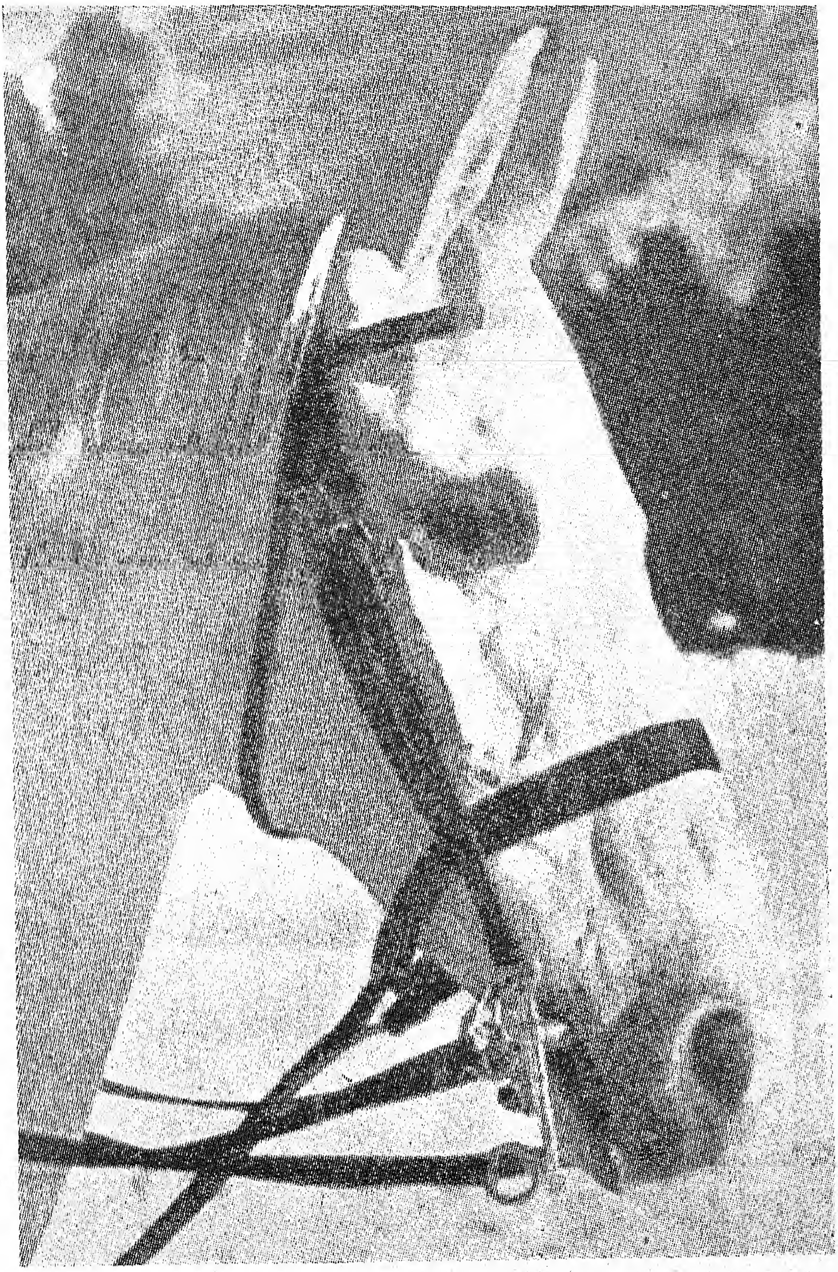


FIG. 3.—A properly fitting bridle and standing martingale. Note the absence of superfluous buckles, and the breadth and position of the noseband.

The best bits are made of steel because of its great strength, but as steel rusts, it needs constant burnishing. Not everyone can

afford the time or servants to keep steel bits clean, and consequently non-rusting nickel bits have become popular. They are much inferior to steel in strength.

The Curb Chain.

The curb chain should consist of broad links, which should be twisted until they are flat before being attached to the hook. Two fingerbreadths between the chin and curb chain when the bit is hanging normally in the horse's mouth, is the usual space allowed, but this will vary with different horses.

Martingales should not be worn unless necessary. It is a mistake to show a hack in a martingale. A hack is supposed to be sufficiently well-mouthed to need no artificial aid to keep its head in the right position, and the presence of a martingale implies that it is not so trained. Of course, a standing martingale is necessary on a polo pony. It should have a sewn loop through which the noseband passes, and an adjustable, buckled loop through which the girth passes between the forelegs. It is a mistake to have sewn loops at either end and an adjusting buckle some distance below the noseband, in other words, to have the martingale in two pieces, as the tongue of the adjusting buckle soon cuts through the leather.

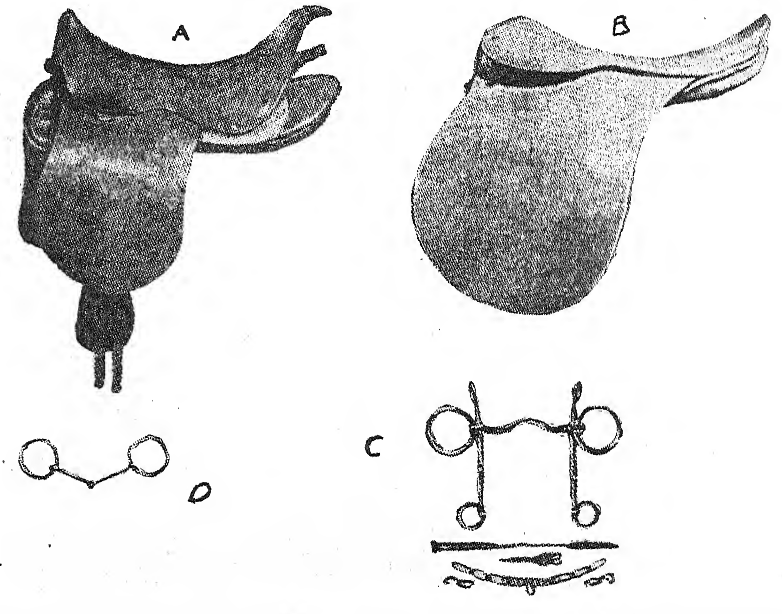


Fig. 4.—A. British military saddle. B. English hunting saddle. C. Pelham bit, lip strap and curb chain. D. Snaffle

Saddles.

As regards saddles, it should be realized that there are many and varied patterns, and that the type of saddle one uses greatly influences one's seat. For example, one cannot ride with a "forward" seat in a Western American stock saddle which is built for a straight-legged seat. The so-called colonial saddles are built to enable the rider to ride with a comparatively long leather, because that is an easy type of seat for men who spend long hours in the saddle, and among colonial peoples the trot as a riding pace is not much in vogue. In Europe and in countries where European

influence prevails, the trot is an important gait and the rider rides with shorter leathers to enable him to post at the trot. Nor does he need such aids as high pommels and cantles, or thigh and knee rolls to help him to maintain his seat, as he rides comparatively quiet horses. The seat of the European type of saddle is therefore more or less flat, and the saddle is reduced to the limit of plainness consistent with comfort. The flaps are cut either comparatively straight or forward, in accordance with the length of stirrup favoured by the rider.

It is necessary to give some attention to the military saddle, as many thousands of these have found their way on to the market as surplus war stock. This is a strong, serviceable saddle without any stuffed panels. The wooden side bar is covered with a numnah panel and yet another numnah or saddle blanket is interposed between the saddle and the horse's back. The latter is preferable since it can be folded in different ways to give a greater or lesser cushioning effect as is required by the muscling of the horse's back. Unless care is exercised in fitting the saddle, it will often cause

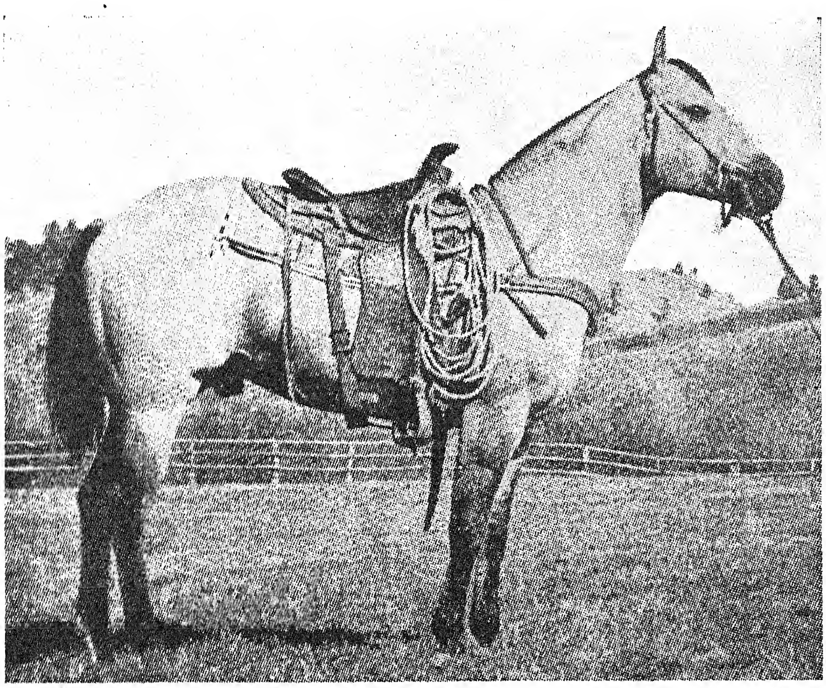


FIG. 5.—Buckskin Joe, with cowboy outfit.

galls because of the absence of stuffed panels and consequent lack of padding. Furthermore, the sidebars project beyond the front arch of the saddle, and these projections (the burrs) often press against the shoulder blade, interfering with its play and causing a nasty gall.

The military saddle blanket measures approximately 5ft. 9in. in length and 4 ft. 10 in. in breadth. The blanket is first folded in its length and then in its breadth. This gives two folded and two raw edges. The folded edges are placed to the front and off side of the saddle. Care must be taken to lift the blanket well into the channel of the saddle so that there is no pressure on the withers

and spine. The blanket must also not be allowed to wrinkle under the saddle. If more than four folds of blanket are required under the saddle, the blanket can be folded in three layers across the back and the ends then turned up under the side bars. It is not desirable to carry the ends of the blanket well up into the channel of the saddle as this may cause pressure on the spine and prevent the free circulation of air. When this arrangement is likely to be permanent, the folds of the blanket can be kept in place by a few stitches.

Riders should be careful to use the type of saddle best fitted for the work in hand. Thus a heavy stock saddle would be entirely out of place in a hack class at a show, the only saddle permissible in this instance being a hunting saddle. This in turn would be of little use to a man undertaking a journey and having to carry a certain amount of equipment with him. Here a larger, heavier saddle with the necessary D's for the attachment of kit would be necessary.

A well made saddle is an expensive article, but it is well worth buying in preference to something cheap, not only because of the additional comfort it will give both mount and man, but also because of the very long life that can be expected of it.

New saddlery may be treated with neatsfoot oil (applied with a flannel cloth) as this softens and preserves the leather. It is a mistake, however, to soak articles of saddlery in neatsfoot oil as this will cause them to stretch and rot, and the oil continues to work out of the leather for a very long time, which, in the case of saddles, is of no advantage to the breeches. Saddlery should be regularly washed and polished with saddle soap. It should never be polished with boot polish. Riders in this country should be careful in their choice of saddlery as the market is flooded with much inferior material.

Stirrup irons, like bits, should be of steel for preference, but one may have to be content with nickel. They should be strongly made and give ample room to the foot, so that in the event of a fall the foot will slip out easily.

Girths are of many types and material. In the writers' opinion the folded leather girth is the best. The folding ensures a rounded edge which does not chafe, and the girth can be kept permanently soft by including between the folds a length of flannel soaked in neatsfoot oil. There are certain adventitious pieces of saddlery such as cruppers, breast-pieces, and martingales, which must be dealt with. Mention has already been made of the standing martingale. Running martingales have a split leather strap carrying two rings at the end through which the curb reins pass. They give a certain amount of control over a horse that throws its head about. They should be so adjusted that, when the horse is standing at attention with its nose at the level of its withers, the martingale is just taut. One often sees horses at country shows with running martingales adjusted very short, so as to give additional leverage to the curb rein in order to get the animals to arch their necks (very often to overbend and bore into their chests). This procedure will speedily ruin any horse's mouth.

When running martingales are used, the bit reins should carry leather guards of about $\frac{3}{4}$ in. by $\frac{1}{2}$ in. between the rings of the martingale and the ring on the bit for the attachment of the curb reins, otherwise the former may work its way over the latter and become caught. As previously mentioned, there is no advantage in a horse appearing in a martingale if he will go equally well without one.

Cruppers and breast-pieces should be used only in mountainous country where they save girthing the horse too tightly to prevent the saddle slipping backwards and forwards during the ascent and descent of steep slopes. They should never ordinarily form part of the rider's equipment.

Harness, Hitches and Vehicles.

Harness.

With slight adjustment, ordinary carriage harness can be used for draught horses. Where possible, collars are to be preferred to breast-plates, but then every precaution must be taken to see that they fit properly at the outset. A good collar should be 2 to 2½ inches longer than the depth of the horse's neck, while the width should leave enough space for the hand to be easily inserted between

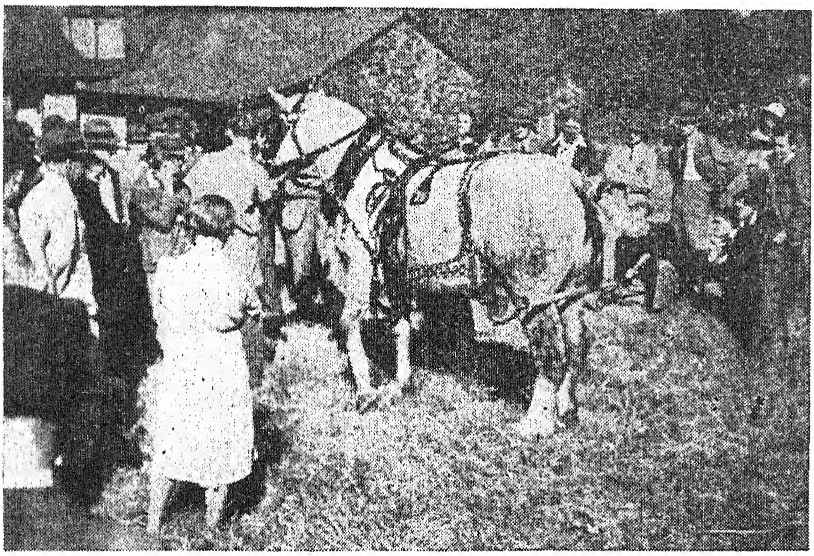


FIG. 6.—A demonstration on harness and harnessing.

the collar and neck and windpipe. Each horse should have its own collar, since with use it shapes itself more to the horse's shoulders, thus giving a perfect fit. Most open collars are made too short or too narrow. The good collar when pushed back hard against the shoulders should leave enough space to insert the flat hand easily between collar and windpipe. If collars fit properly, no sweat pads or space pads need be inserted. The face of the collars must be kept clean and smooth by washing and not scraping. (The accompanying photos show a good set of harness for wheelers. Note the coupling to the beam and collar.)

Hames must fit collars correctly; if too short, the collar will be pulled out of shape. The hames must fit the rim of the collar closely at all points.

Traces must be fastened about one-third the way up on the shoulder and must be of equal length. Make sure that all parts of the harness—bridle, bit, throat latch, girths, etc.—fit comfortably.

If the bit is too low, it may get under the tongue; if too high, it may chafe the corners of the mouth. Any other undue tightness

or slackness in any other part of the harness will also cause discomfort or breakages.

Breast-plates are most commonly in use in South Africa. These need not be very broad for heavy horses—3½ inches will suffice—as a broad plate becomes too hot and "burning" results. A good smooth leather lining is preferable to pads of felt or discarded rubber tubing. If a team is rested at reasonable intervals and the harness completely slackened, all spots where pressure is greatest will cool off sufficiently to prevent "burning".

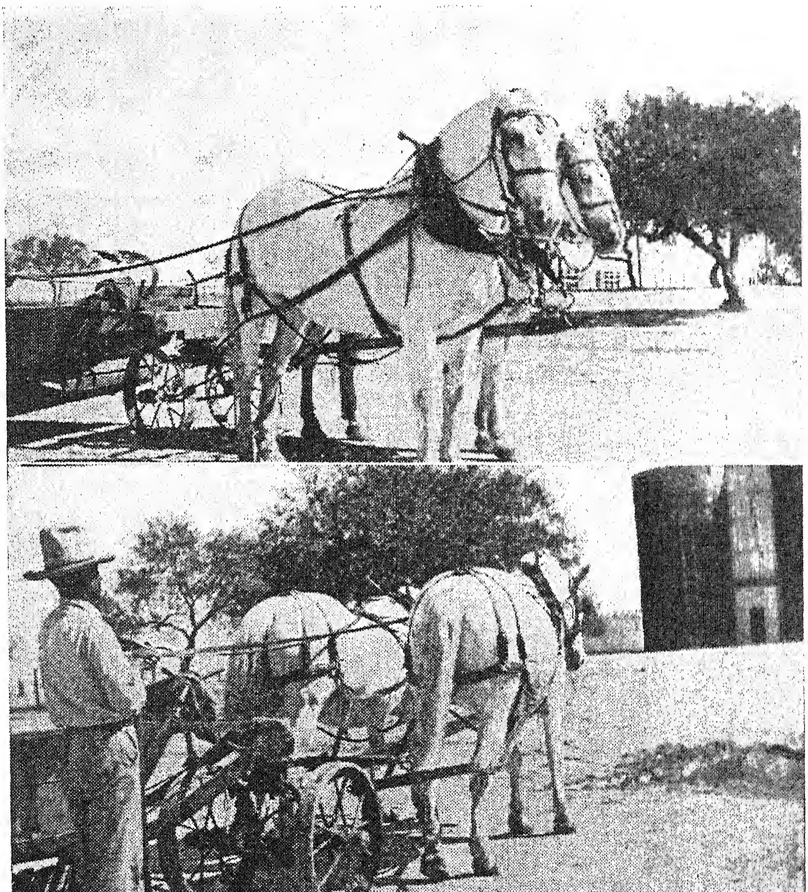


FIG. 7.—A good outfit—front and rear views.

Under continued hard work all collars and breast-plates should be properly cleaned each evening with warm water and a little soap before sweat and dirt dry hard on them. During the first spell of hard work it will be advisable to wash the shoulders and breast of horses every evening with a salt solution. Keep the manes from under the collar when the horse is at work. See to this frequently. The manes of geldings are often clipped—but this would spoil the looks of stallions and mares.

To clean harness properly all the pieces are unbuckled and moistened (but not soaked for more that fifteen minutes) in lukewarm water into which a piece of mild soap has been dissolved.

Each strap or piece is then carefully scrubbed and thoroughly rinsed. By the time all the parts have been scrubbed, those cleaned at the beginning will be fairly dry, and, while still slightly damp, are then oiled with any reputable preparation of which the main ingredient is neatsfoot oil. Good tallow made into a buttery paste with neatsfoot oil also gives good results. A good harness oil can also be made on the farm by melting 2 lb. beeswax and 5 lb. of beef tallow mixed with one gallon of pure neatsfoot oil.

After this process the harness is hung in a dry place—not in the sun or near a fire—and, when the oil has soaked in, the various parts can be rubbed well with a lather of soft-soap to remove surplus grease or any greasy appearance. Such a cleansing and polishing treatment administered to all harness twice a year will not only keep the harness pliable and clean, but will prolong its life very considerably.

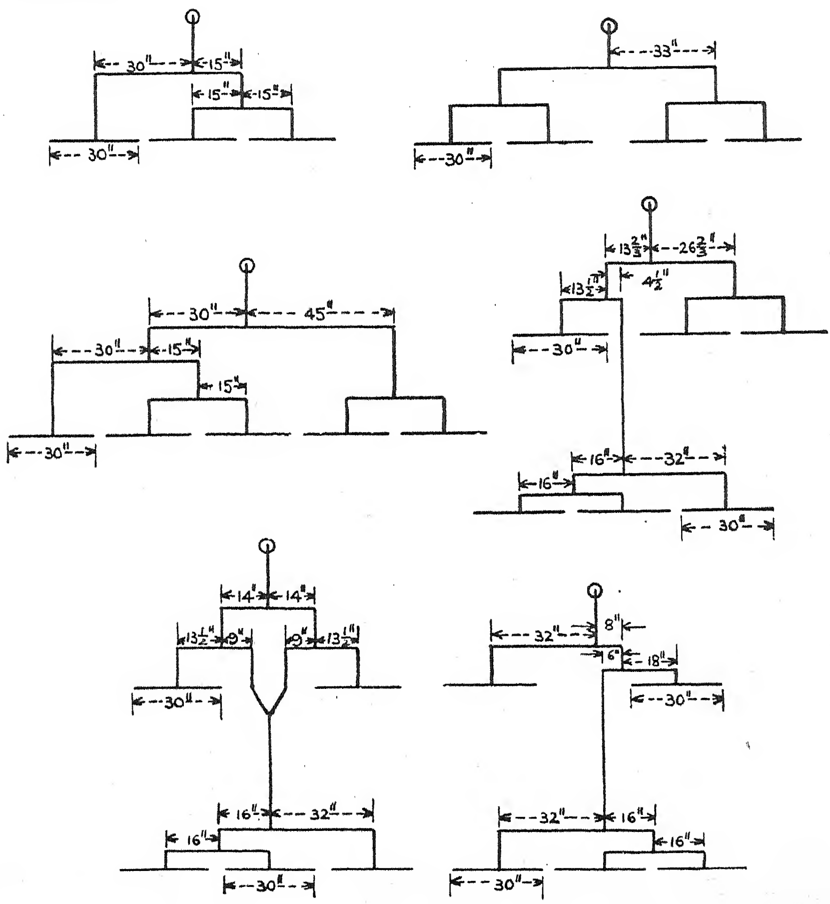


FIG. 8.—Different hitches.

When harness is not in use, it should be hung in a dry harness room. Collars should hang on a peg with the name or number of the horse to which it belongs. Sweat and dirt should be removed with a damp cloth before harness or collars are stored.

Every farmer or user of horses should possess a repair kit, the main equipment of which consists of a pair of pliers, several awls, an assortment or needles, several balls of good thread or riempies, a cake of wax, a wooden clamp (preferably attached to a stool), several pieces of leather, snaps, buckles, and possibly also edging tools and creasers for repairing saddles.

Harness should always be kept in good repair. Any idle spell, apart from routine attention, should be devoted to a good overhaul and thorough cleaning and mending of the harness. Well cared for harness will last a remarkably long time and must add to the success of the general farming operations.

The Cape Province is famed for its good "riempie"-sewn white leather harness—a product equal to the best from anywhere else. . Such harness, if made by reputable firms and well cared for, lasts for many years. Careful measurements should be made of the average type of heavier horse used, so that comfortabe fits may be assured.

Multiple Hitches.

Fewer horses can pull a given load when they are used in abreast hitches. The main advantages of the multiple hitch are:—

(1) It eliminates side-draught, thus increasing the power by approximately 15 per cent.

(2) It enables one man to accomplish more work per day.

(3) It equalizes the pull of the horses.

(4) It prevents crowding and enables horses to keep cooler.

(5) It assures a straight pull from the plough or implement, and prevents sore shoulders, necks, legs and sides.

(6) It is well suited to large horses, for it allows room and freedom for them to work without crowding, and is equally well suited to smaller horses, for more can be used in a team and make up for the lack of strength in each horse.

Multiple hitches of three, four, five and six horses are much in vogue in different parts of the world where horses are the main source of tractive power for farm work. The kinds of multiple hitch sometimes used in South Africa are the four-horse hitch for harrowing rough ploughed lands, and a five-horse hitch for harvesting. Sometimes only three good horses are hitched and at other times five may be used, depending on the size and weight of the horses, weight of the harrows and the type of land and work. The accompanying sketches (Fig. 8) indicate the position of the eveners (swingles). The inside horse or horses are coupled to the outside pair for which only one pair of reins is necessary.

There is a definite saving of horse power and labour in using horses in a multiple hitch. The horses are closer to the load and are handled more easily. A three-hitch team abreast can do more per day than a four-horse tandem team. The three can exert more power and gain time at the turns.

The three-horse swingle can be used on a single-furrow plough, the off side horse walking in the furrow and the other two on hard ground. The four- and five-horse swingles are suitable for harrows, disc and other cultivators, wheat drills, rollers, harvesters, etc., and the farmer using them will quickly see their advantage.

When draught horses are worked abreast, the draught must be evened; this is done by equalizing or compensating swingles as shown in the accompanying sketches. The horses can be coupled one to the other, only two outside reins being necessary. If it is desired, however, reins can be adjusted for three horses so that they steer in the same way as two. To do this, take an ordinary pair of double reins, sew a buckle on each running rein about 6 to 9 inches behind the check-rein buckle, and attach a rein (on both the off and near side rein) a little longer than the check rein (inside rein). The off side running rein fastens on the outside of the off horse, and the check rein on the off side of the middle horse; the additional rein goes across the back of the centre horse and fastens on the off side of the near horse; the near side running rein fastens on the near side of the near horse, and the check rein on the near side of the centre horse; the attached rein passes across tthe centre horse's back and fastens on the near side of the off horse. The attached reins can be passed through a loose ring above the centre horse's back.

FIG. 9.—Stud mares in double shaft and tandem.

The inspanning of five horses in a wagon, trolly or coach is common in Australia, where they are yoked two at the wheel and three in the lead, and the reins adjusetd as above. This five-horse team pulls a load as easily as six horses inspanned two abreast tandem, as all the horses are nearer to the pull, and the reins can be easily adjusted so that each horse is absolutely under the control of the driver.

Vehicles.

In using draught horses for heavy hauling, the greatest advantage is obtained in lightening the vehicle as much as possible. In pre-rubber days, wagon builders supplied vehicles with ball-bearing wheels; but with the introduction of the pneumatic tyre users of horses were not slow in fitting the new type of wheel to all kinds

of horse-drawn vehicles. With the correct type of wheel, loads can be more than doubled for the same horse power in comparison with vehicles equipped with iron tyres. Additional advantages of pneumatic tyres are that an increased load capacity is assured owing to lighter construction and a smaller amount of "dead" load; the life of the vehicle is prolonged considerably; and the damage to road surfaces is greatly reduced. Apart from these economic advantages there is less noise and a smoother transit in city streets. Almost any vehicle can be equipped with suitable pneumatic tyred wheels, but certain firms build suitable wagons and carts for different types of transportation. Even the donkey-drawn rural school cart is not forgotten.

The main considerations in the construction of such vehicles are that the framework should be light but strong, and the type of pneumatic tyred wheel fitted should suit the load which the vehicle is to carry and the road on which it is to work.

FIG. 10.—Stallion in double shaft and collar.

In pre-motor days a large assortment of vehicles was used:—hansom cabs, Cape carts, spiders, wagonettes and larger horse wagons. The horse-wagon is still common on the larger grain farms of the Cape, while the 8-horse or 8-mule teams of the Cape are national institutions.

On the more intensive farms, the lighter but strong pneumatic tyred wagon for two or four heavier draught horses is more common. A very useful vehicle on almost all farms is a light pneumatic tyred wagon, with changeable single and double shafts. In double shafts the stud stallion or mare can draw all the lighter loads about the farm, while for heavier loads the single shaft can be fitted for a pair. This outfit is more economical and practical than a lorry, and is to be preferred to the large scotch-cart which, with two wheels and a heavy load on indifferent or wet farm roads, is rather severe on one horse, especially a pregnant mare.

Wastage in a Valuable Industry.

C. R. Wyche, Senior Professional Officer, Division of Agricultural Education and Research.

FIGURES available up to the present indicate that the value of the Union's production of hides and skins during 1946 exceeded £6,000,000.

Due to regulations promulgated under the War Measures Act, a certain amount of improvement was effected during the war years in the curing of hides derived from abattoirs. Although the curing of *skins* was not regulated, improvement in their curing is also taking place due to the propaganda work undertaken by the Inspectors of the Department of Agriculture appointed to see that the regulations governing the curing of hides are carried out at the various abattoirs and by the curers.

It is gratifying to note that farmers in general are becoming more hide-and-skin conscious than they formerly were, but there still remains considerable room for improvement before any appreciable reduction in the wastage in hides and skins will be perceptible.

The tables given below indicate the weight (in lb.) of the main types, classes and grades of hides and skins exported from the Union during the calendar year 1946. The figures have been collated from the monthly reports submitted by the Hide and Skin Inspectors at the various ports. As 1946 was the first year in which such detailed records have been kept, it is not possible to compare these figures with those of previous years.

Hides and Skins Exported During 1946.

TABLE I.—*Merinos.*

Class.	Sound. (*a*)	Secondary. (*b*)	Damaged. (*c*)	Sound.
	lb.	lb.	lb.	%
Super combing	1,532,064	—	611,403	71·5
Combing	2,197,708	—	1,326,976	62·4
Long	1,502,573	—	1,520,635	49·7
Medium	1,018,519	—	1,420,031	41·8
Short	955,572	—	1,520,147	38·9
Pelts	668,238	—	482,639	58·1
Long Lambs	1,817	—	6,209	22·6
TOTALS	7,876,491	—	6,870,040	53·4
TOTAL (*a*) and (*c*)	14,746,531	—	—	—
Shearlings	11,999,018	2,143,192	—	84·8
TOTAL Shearlings (*a*) and (*b*)	14,142,210	—	—	—

Merinos constitute the largest number and greatest weight of skins exported. It will, however, be noted that, of the total weight of Merinos exported, only 53·4 per cent. was sound, whereas 46·6 per cent. was damaged. The major portion of the damage is preventable as reports indicate that only a small percentage of skins was classed as damaged owing to drought. Even here proper provision of reserve food supplies would have reduced even this small percentage.

The main causes of damage in Merinos are knife marks and cuts, faulty and uneven curing, skin beetles and moths.

Shearlings are also merino skins, but are classified separately as they are used for a different purpose from other classes of Merino. "Merinos" are de-woolled, whereas shearlings are used with the wool on the pelt for the manufacture of coatings, imitation furs, etc. In shearlings it is of primary importance that the pelt should be sound and of good shape. The shape of the pelt depends on how the skin was "opened up" or "ripped" when flaying was commenced. Skins with wool over 2 inches in length (e.g. combing) are not usually put with shearlings.

There are no damaged shearlings as these would be classified as "Merino" type.

TABLE II.—*Coarse and Coloured Crossbred*:—

Class.	Sound. (a)	Damaged. (b)	Sound.
	lb.	lb.	%
C. and C.	202,851	47,982	80·9
X-Bred	334,053	77,139	81·2
TOTAL	536,904	125,121	81·1
TOTAL (a) and (b)	662,025	—	—

These figures would indicate that the proportion of Sound to Damaged was relatively high. In actual fact this does not reflect the true position, as the export of C & C and X-Bred skins is prohibited except under permit, and no exports have taken place since July 1946. The output of these skins is reserved for use by local tanners for the manufacture of lining leathers, of which there is a great scarcity, particularly since the imposition of sanctions by the Government of India. Local tanners do not, however, use damaged C & C and X-Bred skins to any large extent. As a result there has been an accumulation at the ports of these damaged skins, which, if exported, would have considerably reduced the percentage of sound skins.

The value of C & C and X-Bred skins lies primarily in the pelt rather than in the wool that is on it. On this account good shape, careful flaying and proper curing are of great importance.

TABLE III.—*Gloving Skins*:—

Class.	Sound.	Secondary.	Damaged.	Sound.
	lb.	lb.	lb.	%
Large W.P.	2,795,189	502,717	—	84·8
Medium W.P.	479,526	167,482	—	74·1
Large Woolly	1,370,694	150,913	—	90·1
Medium Woolly	153,873	28,506	—	84·4
Large Persian	947,975	87,944	—	91·5
Medium Persian	268,966	50,444	—	84·2
Light Medium	101,445	34,195	—	74·8
Lamb	25,324	7,274	—	77·7
All Classes.	—	—	312,783	—
TOTALS	6,142,992	1,029,475	312,783	82·1

The export regulations make provision for three main classes of gloving skins, viz. Western Province (W.P.), Woolly and Persian types. Good South African gloving skins are considered amongst the best in the world for the production of gloving leathers. Unfortunately too few really good skins are produced owing to some or other preventable blemish, with the result that the whole production is prone to be graded down. In Table III, 82·1 per cent. of gloving skins are shown as sound, but they are not as good as they could be with better treatment and care.

Out of the total of 7,485,250 lb. gloving skins exported, 13·8 per cent. were Secondary and 4·1 per cent. Damaged. As the sole value of these skins lies in their potential leather value, the treatment of the pelt is of the utmost importance. To ensure a good spready skin, good ripping is necessary, together with proper curing, including the careful removal of adhering fat, which, if not removed, will cause a stain on the skin next to it in the pile.

The skins are frequently spoilt by knife marks and cuts, bad shape, faulty curing, fat stains, beetle and moth damage, steekgras and paperiness due to poor nutrition.

Table IV.—*Goats.*

Class.	Sound.	Secondary.	Damaged.	Sound.
	lb.	lb.	lb.	%
Extra Light D.S.*	478,842	226,837	—	67·9
Light D.S.*	707,544	193,569	—	78·5
Medium D.S.	561,106	64,168	—	89·7
Heavy D.S.	255,747	30,297	—	89·4
Kid D.S.	22,347	17,772	—	55·7
Bastard D.S.	42,352	9,216	—	82·1
Extra Light S.D.†	9,670	11,736	—	45·2
All Classes	—	—	234,683	—
Totals	2 ,077,608	553,595	234,683	72·3
Angora	346,865	37,601	31,695	90·2

Total goat skins exported (excluding Angora)...... 2,874,886 lb.
Total Angora skins exported..................... 416,161 lb.

*D.S. Drysalted. †S.D. Sundried.

As with gloving skins, the sole value of goat skins (other than Angora) lies in the pelt.

It will be observed from Table IV that only 72·3 per cent. of the total goat skins exported were graded as Sound, while 19·2 per cent. and 8·5 per cent. were Secondary and Damaged, respectively. In other words, almost 30 per cent. of goat skins had sufficient blemishes to be graded down. Blemishes found in goat skins are similar to those in gloving skins, including cracks in the grain (hair side) surface of the skin due to folding.

The export figures given in Table IV represent about two-thirds of the Union's 1946 production of goat skins, as one-third is used by local tanners and sold to them at controlled prices.

Of a total of almost 10,000,000 lb. of drysalted and sundried hides exported during 1946, only 21·6 per cent. were classified as Firsts. Even in Firsts certain blemishes are allowed, viz. one brand mark and one defect on the hide other than on the butt.

Firsts from other countries are free of brands and defects. A normal size brand on the butt reduces the value of a hide by at least 3s. 6d., and many hides have more than one brand mark. The wastage in hides is colossal, due to bad ripping, bad flaying, faulty curing including sun-baking, horn marks, barb-wire scratches, whiplash marks, tick marks, beetle and moth damage, and cracked grain due to incorrect or over-folding. (Hides should be folded once only, down the line of the backbone with hair side inside to protect the grain surface.)

TABLE V.—*Hides*.

	First.		Second.		Third.		Fourth.		Total.
(i) *Dry-salted.*	lb.	%	lb.	%	lb.	%	lb.	%	lb.
10/20 lb.	281,153	22·1	214,269	16·8	535,731	42·0	243,057	19·1	1,274,210
20/30 lb.	486,219	29·3	246,232	14·8	676,114	40·8	249,778	15·1	1,658,343
30 up...	—	—	—	—	42,363	95·9	1,786	4·1	44,149
Kip....	136,786	41·4	86,480	26·2	80,987	24·5	26,111	7·4	330,364
Calf....	144,618	38·7	100,758	27·0	94,431	25·3	33,536	9·0	373,343
TOTALS.	1,048,776	28·5	647,739	17·6	1,429,626	38·8	554,268	15·1	3,680,409
(ii) *Sun-dried.*									
10/15 lb.	262,815	17·5	332,363	22·2	524,971	35·1	377,993	25·2	1,498,142
15/25 lb.	766,878	18·1	743,226	17·5	1,534,910	36·3	1,188,644	28·1	4,233,658
Kip....	51,152	12·5	72,740	17·8	150,977	37·1	132,930	32·6	407,799
Calf....	19,924	15·6	24,297	19·0	44,447	34·8	39,199	30·6	127,867
TOTALS..	1,100,769	17·6	1,172,626	18·7	2,255,305	36·0	1,738,766	27·7	6,267,466
TOTALS (i) and (ii).....	2,149,545	21·6	1,820,365	18·3	3,684,931	37·0	2,293,034	23·1	9,947,875

Note.—The % shown after each weight indicates the percentage within the weight grade.

General.

It may not be generally known that a levy is imposed on all hides and skins exported, and that certain of the local tanners pay a voluntary levy on hides used locally. The funds so derived are administered by the Hide and Skin Advisory Board on which are representatives nominated by farmers, tanners, shippers, brokers and curers. This Board was created primarily to bring about improvement in the hide and skin industry. Certain improvements have been effected, mostly from the shipping end, but from evidence available it would appear that only a few farmers have responded to any appeals for improvement that have been directed to them from time to time.

The only area in which a definite improvement is noticeable is the Transkei. where, due to representations made by the Hide and Skin Advisory Board, a Hide and Skin Inspector is stationed who is doing excellent work among the traders.

Any persons who wish to improve the quality of their hides and skins should contact their Regional Office of the Division of Soil Conservation and Extension for particulars.

Temporary Cribs for Storing Mealies on the Cob.

G. M. Dreosti and S. J. Cillie, Dehydration and Cold Storage, Cape Town.

THE following information is submitted at the request of the Mealie Industry Control Board to assist farmers in building temporary cribs for the forthcoming crop. It should be stressed that although there are many different kinds of ventilated and unventilated cribs, of both permanent and temporary construction, the information given here confines itself to the design of simple, temporary unventilated cribs which can be built in time for the 1947 season from such materials as may be obtained by farmers at the present difficult time.

If, in due course, the principle of storing maize on the cob becomes a permanent feature of our industry, the temporary cribs will no doubt be superseded by more elaborate and permanent designs.

Although a certain amount of drying occurs in the cribs, it cannot be too strongly emphasized that mealies should only be placed in cribs when the moisture content is below about 20 per cent. The rate of drying of mealies in cribs is very much slower than when the cobs are on the stalks in the fields or when the ears are hung up where they are fully exposed to the wind.

Finally, the mealies should be husked clean before cribbing as the presence of husks and silk very seriously interferes with air movement through the crib, and consequent drying.

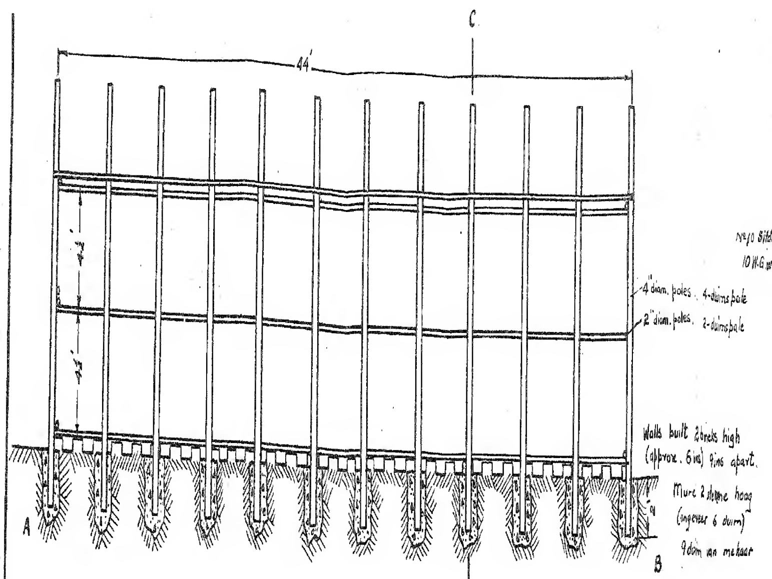
The cribs should be erected in the open where they are not shielded from the wind by buildings or trees. A suitable size would seem to be about 9 feet wide, 9 feet high and 44 feet long, as indicated in Drawing No. 1. Drawing No. 4 shows a pictorial view of the crib.

This crib would hold the equivalent of approximately 30 tons of shelled mealies. The wagons can be drawn up alongside and the maize dumped into the cribs through the 2′ 6″ gap under the high side of the roof; and maize can be removed through the end, stable-type door shown in Drawing No. 2.

The crib should be erected with the specific purpose of allowing the maximum circulation of air through the maize, and should be built with the sides facing the direction of prevailing winds. The roof should be rain-proof, but the walls and floors should be of the most " open " construction possible, consistent with retaining the product in the crib.

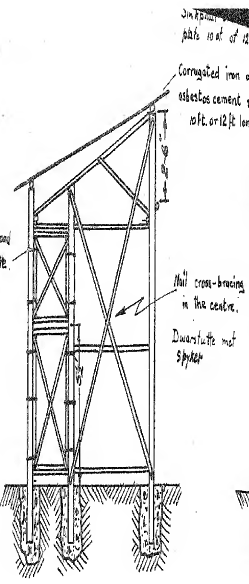
Good Ventilation Essential.

The dimensions of the crib have been chosen so that exactly one 50-yard roll of 6-foot and one roll of 3-foot wire netting will be used per crib. The crib does not necessarily have to be made this size, but the maximum width must in no case exceed 9 feet, as wider cribs would not permit of adequate air circulaton. Nor should the indicated height be exceeded, as this would render loading from wagons more difficult, and furthermore the whole structure would also be less stable. If 4-inch diameter poles are used, these should be spaced



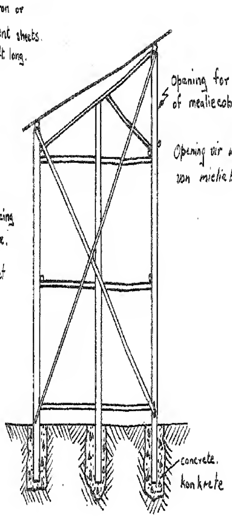
FRONT VIEW.
VOORAANSIG

DRAWING No 1.
TEKENING No 1



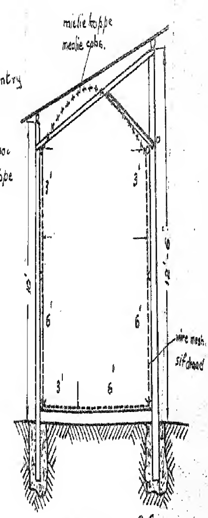
END A - SHOWING DOORS.
AANTONENDE DEURE

DRAWING No 2
TEKENING No 2



END B

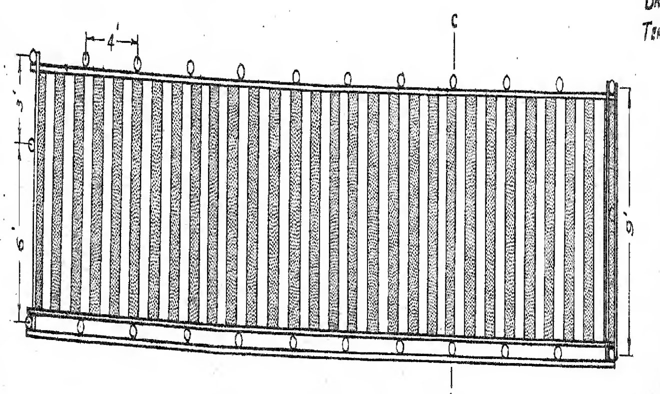
DRAWING No 2(a).
TEKENING No 2(a)



DEURSNEE CC.
SECTION CC.

DRAWING No 2(b).
TEKENING No 2(b)

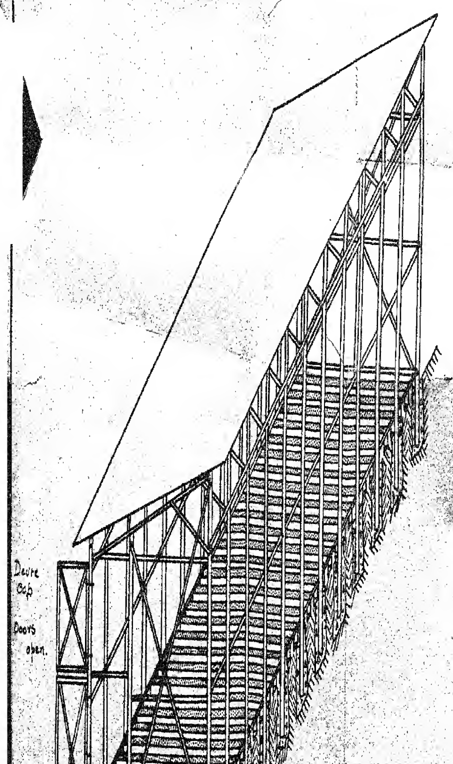
HOKKE VIR OPBERGING VAN MIELIEKOPPE.
FARM CRIBS FOR STORING MEALIES ON THE COB.



VLOERPLAN FLOOR PLAN.

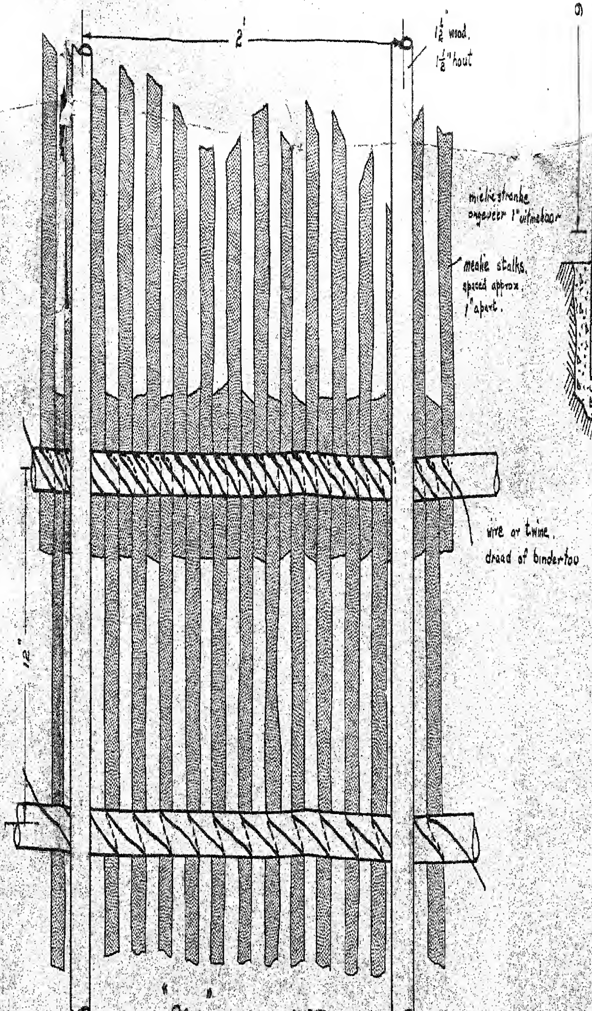
TEKENING No 3 DRAWING No 3.

Draad om te gebruik } $1\frac{1}{2} \times 1\frac{1}{2} \times 15$ draad
Wire to be used } wire gauge NETTING or CHAIN LINK MESH.
sifdraad



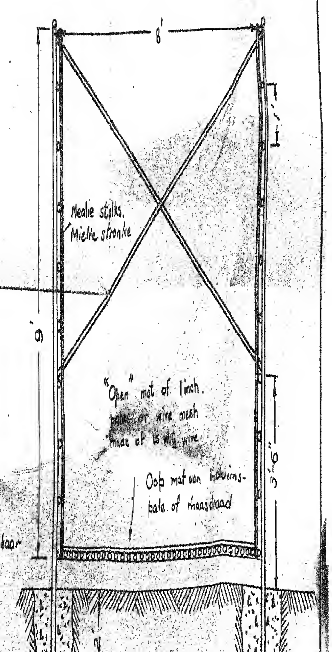
PICTORIAL VIEW [without wire mesh.]
HOE SKUINS VAN DIE KANT GESIEN [SONDER SIFDRAAD]

DRAWING. No 4.
TEKENING No 4.



DRAWING No 5.
TEKENING No 5.

"OPEN" WALL OF MEALIESTALKS.
"OOP" MUUR VAN MIELIESTRONKE



DEURSNEE VAN BAK
SECTION OF BIN.

DRAWING No 6.
TEKENING No 6

DEPT. OF AGRICULTURE,
OFFICER-IN-CHARGE, DEHYDRATION AND COLD STORAGE.
FARM CRIBS FOR STORING MEALIES ON THE COB.
DWG. No. 81
DATE 27-2-47

at 4-foot intervals, but thinner poles should be placed closer together. The required spacing can be calculated from the fact that the strength of poles varies as the cube of the diameter. For example, 3-inch poles should be spaced about 2 feet apart. The poles should be firmly fixed in the ground to a depth of about 2 feet, preferably with concrete, to prevent the crib from leaning or blowing over. As an additional precaution, the uprights should be firmly braced across as shown in Drawing No. 2.

The crib has been designed for the use of wire netting of 15-gauge 1½-inch mesh.

The use of thinner gauge wire is not recommneded, but if used, the uprights and horizontal beams should be placed more closely together. Even with the suggested wire netting there will be appreciable bulging of the sides of loaded cribs.

The floor should be constructed as shown in Drawing No. 3. The 9-inch brick walls, two bricks high, running across the crib should be spaced at a clear distance of about 9 inches apart. This will allow of adequate ventilation through the bottom of the crib; and the gaps can easily be cleaned of debris which collects there during use.

During unloading of the crib, loose planks should be laid over the floor to take the load of wheelbarrows, or other traffic. If corrugated iron for the construction of the roof is unobtainable, the crib could be covered with wood or tarpaulins, as an emergency measure, or even left open, and only covered when rain is expected.

If wire netting is unobtainable, the crib could be lined with wooden strips or laths (off-cuts, paling, rustics) or even with mealie stalks, from which all leafy material has been removed.

As the latter materials would somewhat restrict air circulation through the crib, it is recommended that in such cases the width be restricted to a maximum of about 8 feet across.

In using mealie stalks, 1½-inch horizontal beams should be spaced at a maximum distance of 1 foot apart as shown in Drawing No. 6, and preferably closer. It is unlikely that the mealie-stalk walls would last more than one season. Whether wire netting, wooden laths or mealie stalks are used, these materials should be attached to the *inner* side of the vertical and horizontal supports. The laths or stalks should be spaced one inch or slightly less apart (as shown in Drawing No. 5), and be tied to the horizontal supports with thin wire or twine; if there is any overlapping, the lower layer should overlap the one above, when viewed from the inside of the crib, to permit proper run-off of rain water. It must be stressed, however, that the maximum amount of free space should be left between successive stalks or laths, consistent with retaining the cobs, to allow of free air movement through the stack, and that the cobs should be as clean as possible, with a minimum of attached silk or debris.

In conclusion, it must be pointed out that the abovemetioned drawings and dimensions for the erection of cribs are purely the result of calculation. The writers have not yet constructed such cribs.

Agricultural Engineering.

IV. Hydraulics: Simple Pumps and the Delivery of Water.

E. A. Oosthuizen, Lecturer in Engineering, College of Agriculture, Potchefstroom.

THE science which deals with problems connected with liquids in motion is called hydraulics, and under this heading the raising and delivery of water by means of simple pumps are briefly discussed in this article.

The most common causes of inefficient and uneconomical pumping plants—and often of complete failure—are the use of too small piping for the required quantity of water, and the application of insufficient power to perform the work.

In the following discussions the writer has endeavoured to present in practical language the fundamental principles of the pumping of water, so that they will be easily understood by both student and farmer, and it is hoped that the work will at least be a guide to those who have to select pumping plant.

Properties and Behaviour of Water.

One gallon of water weighs 10 pounds.

One cubic foot of water = 6·24 gallons.

One cubic foot of water weighs 62·4 pounds.

Water is only slightly compressible.

The pressure of water is equal in all directions.

Water will always seek its own level, and the surface of water at rest is horizontal.

The pressure water exerts is in proportion to its depth, irrespective of its volume or extent.

When water flows in a pipe, there is friction not only between the particles of water, but also between the water and the bounding surface of the pipe.

Simple Pumps.

The two types of pumps most commonly used in farming operations are the "reciprocating" pump and the "centrifugal" pump.

1. Reciprocating Pumps.

The reciprocating pump may be either (*a*) single acting, with one or more cylinders, or (*b*) double acting, again with one or more cylinders.

With the single acting reciprocating pump, an outward and inward stroke of the plunger are required to deliver water. The outward stroke creates a partial vacuum, causing water to flow into the cylinder through the suction valve. The inward stroke causes the suction valve to close, and delivers the water through the delivery valve.

In the double acting reciprocating pump cylinder, there are inlet and outlet valves on both sides of the piston. A stroke in one direction therefore serves as the suction stroke for the cylinder on one side of the piston, and also as the delivery stroke for the cylinder on the other side of the piston so that water is delivered at every stroke instead of at alternate strokes.

Reciprocating pumps are divided into (*a*) "lift" pumps, and (*b*) "lift and force" pumps. The "lift" pump raises the water by suction to a cylinder, and there discharges it. The "lift and force" pump raises the water by suction to the level of the cylinder,

and then forces it through pipes to any desired height above that level.

The "lift" pump (Fig. 1) consists of a cylinder C, a suction valve V, a piston or plunger P, with a delivery valve V2 opening upwards, a suction pipe S, and an outlet O.

The "lift and force" pump (Fig. 2) is similar to the "lift" pump, with the exception that it has a packing box B. An air chamber A is advisable in force pumps, especially if the delivery head is great. The function of the air chamber is to act as an air cushion or spring, since the air in the chamber is compressed in its upper part during the forcing action of the pump, and, when such action is checked by the reversal of the pump stroke, the resulting elasticity acts upon the water column as a spring, tending to keep it in motion, pending the following forcing stroke, and thus aids the action of the pump and prevents shock.

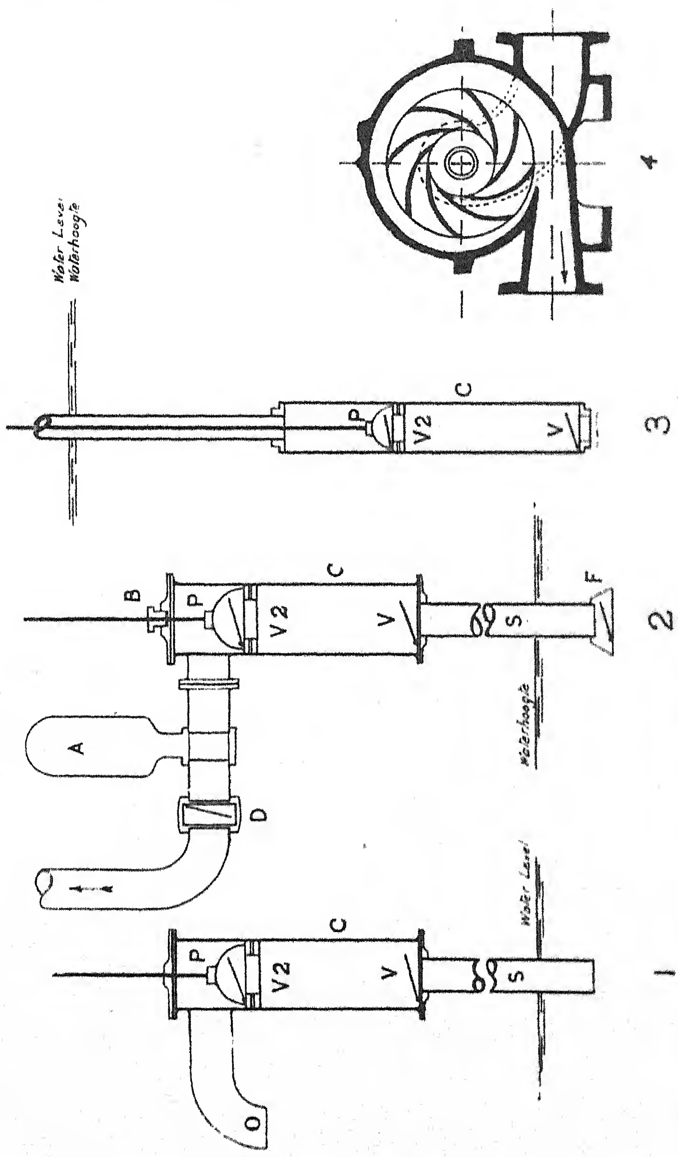


FIG. 1.—The lift pump. FIG. 2.—The lift force pump. FIG. 3.—The deep well cylinder. FIG. 4.—Centrifugal pump. Cross-section of casing and impeller.

It is also advisable to have a non-return valve D on the delivery pipe to aid the action of the pump still further. In all "lift" pumps the suction pipe should have a foot valve F, as the water raised in the suction pipe is liable to slip back. The foot valve keeps the water gained at each stroke, and, if properly fitted, retains the pipe full of water when pumping is discontinued.

Atmospheric Pressure.

The weight of the atmosphere at sea level is equal to that of a column of mercury 30 inches high, or a column of water 34 feet high. Thus, at sea level, the pressure of the air is $\frac{34 \times 62 \cdot 4}{144}$, or nearly 14·7 lb. per square inch. It follows that, if the end of a vertical pipe is inserted in water, and the air then withdrawn from the pipe so that a vacuum is created therein (or the space in the pipe is void of any pressure), the water will be forced up the pipe into the vacant space since the water outside the pipe is subject to an atmospheric pressure of nearly 15 lb. per square inch.

The theoretical height, therefore, to which water will rise in the pipe under a perfect vacuum at sea level is 34 feet. At this height it would balance the atmospheric pressure, and will remain so balanced as long as the vacuum is maintained within the pipe. Hence, the suction lift of a pump is due solely to the pressure of the atmosphere on the free water surface, and its maximum height depends upon the ability of the pump to produce a vacuum in the suction pipe.

The theoretical maximum is 34 feet, but air-leaks, friction and vapour pressure existing over the water surface combine to reduce the maximum to 25 feet. It is advisable to limit still further the vertical lift at sea level to 20 feet for reciprocating pumps, and to 16 feet for centrifugal pumps when pumping cold water.

As the atmospheric pressure alone is responsible for raising the water into the pump, any reduction in the pressure due to altitude also reduces the available suction lift by approximately 1 foot for every 1,000 feet of altitude, it being assumed that the temperature remains unchanged.

Any rise in temperature also reduces the possible suction lift at that altitude. Such then, are the limitations of the suction pump due to natural laws.

TABLE I.—*Barometric pressure at different altitudes, and equivalent heads of water and vertical suction lifts of pumps.*

Altitude, in feet.	Barometric pressure.	Equivalent head of water.	Practical suction lift of pump.	
			Reciprocating.	Centrifugal.
	lb./sq. in.	Feet.	Feet.	Feet.
Sea level............	14·7	4·0	20	16
1,320................	14·02	32·4	19	15
2,640................	13·33	30·8	18	14
3,960................	12·66	29·3	17	13
5,280................	12·02	27·8	16	12
6,660................	11·42	26·4	15	11
7,920................	10·88	25·1	14	10

The lifts in the last two columns (Table I) are from the surface of the water in the well to the highest point reached by the plunger or to the "eye" of the centrifugal pump, and represent the vertical heights to which suction pumps will raise water at different altitudes, with properly proportioned suction pipes.

Deep Well Pumping.

In pumping from greater depths than what atmospheric pressure will allow, the cylinder must be placed below the rest level of the water, i.e. below the depth at which the level of the water ceases to fall during continuous pumping. The general features of the deep well cylinder (Fig. 3) resemble those of the surface cylinder in that it has a suction valve V and a plunger P with cage and delivery valve V2 operating upwards. The rising main is screwed to the top of the cylinder, the plunger being operated by rods running up the rising main to the power plant above.

Capacity of Reciprocating Pumps.—Theoretically the capacity of a cylinder whose diameter is D inches and whose stroke length is L inches, is $\pi \times \frac{D^2}{4} \times L$ cubic inches.

The capacity in gallons would therefore be $\pi \times \frac{D^2}{4} \times L \times \frac{6 \cdot 24}{1728}$.

If the capacity of the cylinder be multiplied by N, the number of pump strokes per minute, the discharge of the cylinder in gallons per minute is obtained.

Thus, discharge $= \pi \frac{D^2}{4} \times L \times \frac{6 \cdot 24}{1728} \times N$ gallons per minute.

The following are modifications of the above formula:

(*a*) $G = 0 \cdot 034 D^2 \times L \times N$

where G = discharge in gallons per minute,
D = diameter of cylinder in inches,
L = pump stroke in feet, and
N = number of strokes per minute.

(*b*) $Q = \frac{D^2 \times S \times N}{6}$ (approximately)

where Q = discharge in gallons per hour,
D = diameter of cylinder in inches,
S = pump stroke in inches, and
N = number of strokes per minute.

As stated above, the equations give the theoretrical discharge of the pump and a deduction of 10 per cent. must be made for valve slip. Hence the actual discharge is 90 per cent. of the theoretical values given by the above formulae.

Example.—How many gallons of water per hour will a 6-inch cylinder with an 18-inch stroke deliver when making 30 strokes per minute?

$$\text{Discharge} = \frac{22}{7} \times \frac{36}{4} \times 18 \times \frac{6 \cdot 24}{1728} \times 30 \times 60 \times \frac{90}{100} = 2{,}978 \text{ gallons.}$$

Or, using equation (*a*)

$$\text{Discharge} = 0 \cdot 034 \times 36 \times 1 \cdot 5 \times 30 \times 60 \times \frac{90}{100} = 2{,}975 \text{ gallons.}$$

Or, by equation (*b*)

$$\text{Discharge} = \frac{36 \times 18 \times 30}{6} \times \frac{90}{100} = 2{,}916 \text{ gallons.}$$

2. The Centrifugal Pump.

The centrifugal pump, one of the simplest of machines mechanically, has, because of its merit, become one of the most used appliances for moving water, or any liquid which will flow through a pipe, to almost any height, and is by far the cheapest form of power-driven pump for irrigation purposes. Since this pump has basically only one moving part, it is cheap to manufacture and simple to operate and maintain, and, since its size may range from ¾ inch to over 100 inches, there are few pumping problems to which it has not been applied.

It is important, however, that the fundamental principles governing the operation and the selection of the centrifugal pump be understood, because, although it is reasonably efficient when performing its correct duty, incorrect selection and application can be extremely uneconomical.

In its simplest form the pump consists of an impeller or disc with vanes fixed to a shaft which revolves at high speed inside a casing with "suction" and "discharge" openings (Fig. 4). The pump is first "primed", i.e. the casing and suction pipe are completely filled with water, and the impeller is then rotated at the required speed by an engine. The vanes on the impeller impart a velocity to the water which is thrown outward by centrifugal force. The casing is so designed as to gather the moving water and guide it to the discharge opening. The greater the speed of the impeller, the greater will be the height to which the water will be forced up the delivery pipe. In being thrown outwards by the impeller the water evacuates the centre or the "eye" of the impeller, thus causing a reduction in pressure at this point.

The suction pipe is led in at the "eye" of the impeller (as indicated in Fig. 4), and, owing to the reduced pressure, a vortex is formed at this entry point, and the pressure of the atmosphere acting on the free water surface then forces the water up the suction pipe into the pump casing.

Since the centrifugal pump is incapable of evacuating air and as the suction is dependent upon the vortex formed, this pump, as previously mentioned, will not provide the same suction lift as the reciprocating pump.

The height to which water can be delivered above the pump can be increased by fitting more than one impeller, the inlet of the second impeller being taken from the outlet of the first, and so on. These additional impellers are called stages. The same result can be obtained by connecting two or more pumps in series, provided the casings will stand the pressure generated.

In selecting a centrifugal pump for certain pumping operations, the *duty* should first be considered, and the pump selected that will perform this duty most efficiently. The practice of adopting a certain size of pump, and then trying to adapt a duty to it, can only lead to inefficiency of operation.

In Table II, which is given purely as a guide, the approximate duties for different sizes of centrifugal pumps are given, the size of the pumps being indicated by the size of the delivery outlet.

TABLE II.—*Approximate duties for different sizes of centrifugal pumps.*

Gallons per minute.	Total head (feet).	Size of pump (ins.).	Revs. per minute.
200	30		1,460
200	50		1,735
200	80	3	2,080
300	50		1,900
300	70		2,175
300	30		1,250
300	50		1,540
300	80	4	1,890
500	50		1,760
500	80		2,050
600	30		1,310
600	50		1,570
600	80	5	1,910
800	50		1,700
800	80		2,030
800	30		1,130
800	50		1,370
800	80	6	1,680
1,100	50		1,490
1,100	80		1,770
1,100	30		1,000
1,100	50		1,210
1,100	80	7	1,470
1,600	50		1,350
1,600	80		1,570
1,600	30		920
1,600	50		1,090
1,600	80	8	1,330
2,000	50		1,180
2,000	80		1,390

Efficiency of Centrifugal Pumps.

The efficiency of centrifugal pumps usually improves as the size of the pump increases, but the efficiency of any given pump varies considerably according to the duty it is called upon to perform. Hence, for efficient operation, the duty must again be considered first, and the pump selected which will perform that duty at its highest efficiency. For example, if 300 gallons of water must be pumped per minute to a total head of 50 feet, a 3-inch pump would probably be selected at a speed of 1,900 R.P.M., and the efficiency would be, say, 70 per cent. If this same pump is to pump 200 gallons per minute by running it at a slower speed, the efficiency would drop to, say, 60 per cent., so that it would be more economical to use a smaller pump for this duty of 200 gallons per minute.

Similarly, if under the same conditions the 3-inch pump were speeded up to give 400 gallons per minute, the efficiency would again drop, and it would probably be more economical to use a larger pump at a lower speed. The efficiency depends upon the design of the pump and cannot be generalized, but, as a rough guide for average pumping conditions, the following efficiencies may be assumed:—

TABLE III.—*Efficiencies for average pumping conditions.*

	Per cent.
Up to 5,000 gallons per hour	50 to 55
From 5,000 to 15,000 gallons per hour	60 to 65
From 15,000 to 20,000 gallons per hour	65 to 70
From 20,000 to 50,000 gallons per hour	70 to 75

In considering pumping projects where water has to be pumped from a river, one is often confronted with the problem of a long suction pipe. Since the vertical suction lift of the pump is restricted, and as long suction pipes are undesirable because of possible air leaks, the suction lift should be as small and as direct as possible.

The height to which water may be pumped, depends upon the design of the pump and the power applied to drive it.

In order to calculate the *horse power* of a pump, it is necessary to know the weight of water raised, and the total vertical height or *total lift* through which the water is to be raised.

To be able to understand fully what "total lift" means, it is necessary to know something about the frictional losses in pipes, and how these affect the flow of water.

Flow of Water in Pipes.

When water flows through a pipe, there is resistance to the flow, caused chiefly by the rubbing of the water against the pipe surface. This resistance is termed *pipe friction*. Because of this friction and the resulting sluggish flow, a certain amount of "assistance" is required to aid the flow through the pipe.

The faster water is made to flow and the greater the length of the pipe, the greater will be the "assistance" needed.

It is also obvious that more "assistance" would be required for a certain quantity of water through a 1-inch pipe, than would be necessary for the same quantity to flow through a 2-inch pipe.

We know that if a pipe be so placed that the end into which we pour water, is a little higher than the exit end, the water will begin to flow, and the speed of the water, and consequently the amount of water which the pipe is capable of carrying when running full, will increase as the intake end is raised above the exit end.

The "assistance" which urges the water to move along the pipe, translated into elevation required to cause a certain amount of water to flow through a pipe at a given speed, is called *friction head*, and is the height that the intake end of a pipe must be raised above the outlet end, in order to overcome the inertia of the water in the pipe, which: (1) increases approximately as the square of the velocity of the water, (2) increases directly with the length of the pipe-line, (3) increases with the roughness of the inside of the pipe, (4) increases with the number of bends or restrictions in the pipe-line, (5) increases with the quantity of water induced to flow through the pipe-line, and (6) is inversely proportional to the diameter of the pipe.

Hence, in dealing with the free flow under gravity in straight pipe lines flowing full, the fall given merely to overcome pipe friction should be equal to the friction head. In problems on the pumping of water, friction head should not be confused with *static head*, i.e., the difference in elevation between the surface of the free water and the point of discharge.

In suction pumps, the static head is made up of the *suction head* and the *delivery head*. The "total lift" of the suction pump is therefore made up of *static head* and *friction head* or, in other words, *suction losses* + *suction head* + *delivery head* + *delivery losses* (Fig. 5).

Since the frictional resistance in pipes varies approximately as the square of the velocity, it can be diminished by using pipes of ample size for the delivery, as well as for the suction.

Several formulae have been evolved for determining in a practical way the friction head or, alternately, the quantity of water which a pipe of given bore and length is capable of delivering in a given time, but most of these are really of little use to the layman.

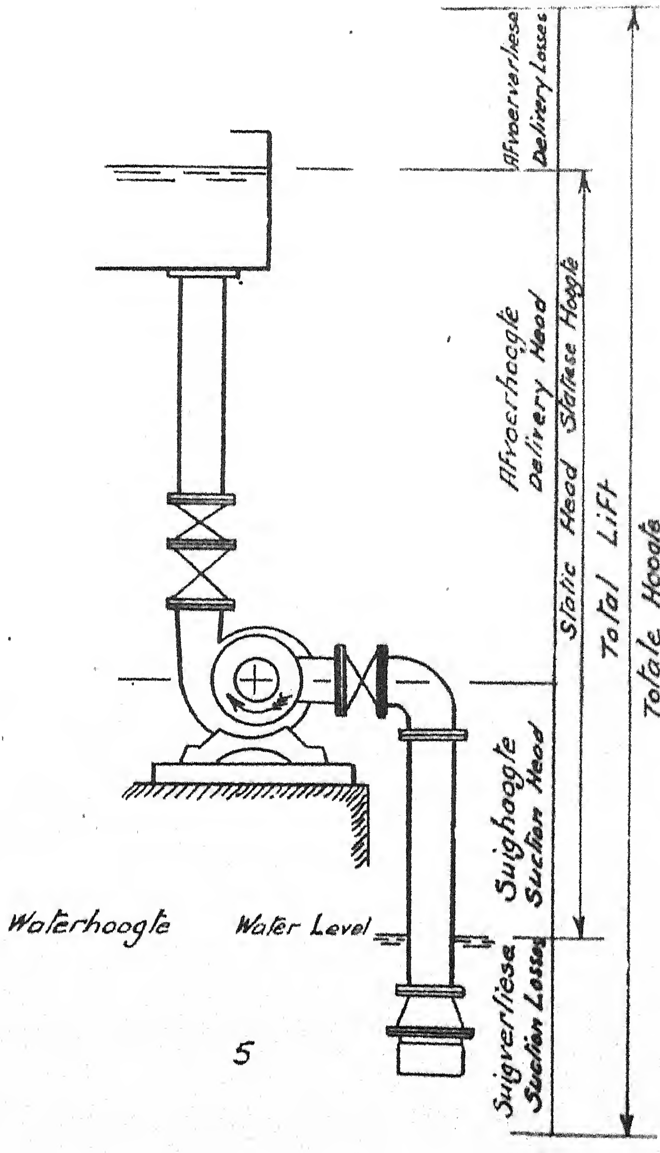


FIG. 5.—Diagram showing how "total lift" is made up.

A simple formula much used, although it gives results which are excessive, is that known as Box's formula in which—

$$H = \frac{Q^2 \times L}{(3 \times d)^5}$$

Or, $$Q = \sqrt{\frac{(3 \times d)^5 \times H}{L}}$$

where Q = discharge of pipe in gallons per minute,
d = diameter of pipe in inches,
L = length of pipe in yards, and
H = friction head of water in feet.

Example.—Find the head required for a 7-inch pipe to discharge 30,000 gallons of water per hour, if the length of the pipe is 1,200 feet.

$$H = \frac{(500)^2 \times 400}{(3 \times 7)^5} = 24{\cdot}5 \text{ feet.}$$

Useful tables for determining the friction head have been compiled and can be found in handbooks and in catalogues issued by manufacturers of hydraulic machines.

Table IV gives the approximate loss of head, for new pipes, due to friction in a straight pipe line.

Horse Power (H. P.) of Pumps.

Suppose it is required to pump 40,000 gallons of water per hour with a centrifugal pump, and to deliver the water 1,500 feet from the pump against a height of 40 feet above the pump. If the suction lift is 10 feet, and the length of the suction pipe 40 feet, compute the horse power necessary at an altitude of 4,000 feet.

Reference to Table II will show that a 5-inch pump will have to be used.

The total length of piping involved is 40 + 1,500 = 1,540 feet. To reduce the friction head in the pipe line means reducing the total lift, and thus the ultimate horse power necessary, since the horse power is directly proportional to the total lift.

The question of the comparative cost of the engine and pipes should be carefully gone into, because a point may be reached where the additional cost of larger pipes outweighs the cost of a larger engine, and in that case additional friction head within reasonable limits may be tolerated, and a larger horse power engine adopted.

By referring to Table IV we find that the friction head for an 8-inch pipe discharging 700 gallons per minute is 1·44 feet per 100 feet, or 22 feet (nearly) for a pipe line 1,540 feet long, while for a 9-inch pipe the friction head is 14 feet (nearly).

This gives a total lift of 40 + 10 + 22 = 72 feet for an 8-inch pipe, and 64 feet for a 9-inch pipe.

A total lift of 72 feet is not excessive, and the comparative cost of engines and pipes will have to decide the issue.

As a general rule, however, it is not economical to have the friction head greater than 25 per cent. of the static head.

TABLE IV.—*Approximate loss of head, in feet, due to friction of water per 100 feet of new piping.*

Delivery in gallons per minute.	Size of pipes (inside diameter in inches).													
	¾	1	1¼	1½	2	3	3½	4	5	6	7	8	9	10	12
5	14·0	4·0	1·4	0·5	—	—	—	—	—	—	—	—	—	—	—
10	44·0	13·0	3·5	2·0	0·5	—	—	—	—	—	—	—	—	—	—
15	102·0	26·0	9·0	3·5	1·0	—	—	—	—	—	—	—	—	—	—
20	180·0	44·0	15·0	6·0	1·5	—	—	—	—	—	—	—	—	—	—
25	—	64·0	21·0	9·0	2·2	0·25	—	—	—	—	—	—	—	—	—
30	—	93·0	31·0	13·0	3·0	0·32	—	—	—	—	—	—	—	—	—
40	—	—	54·0	22·0	5·0	0·72	—	0·20	—	—	—	—	—	—	—
50	—	—	87·0	32·0	8·0	1·10	—	0·30	—	—	—	—	—	—	—
75	—	—	—	73·0	17·0	2·50	1·20	0·62	0·19	—	—	—	—	—	—
100	—	—	—	103·0	32·0	4·50	—	1·20	—	0·16	—	—	—	—	—
125	—	—	—	—	—	7·30	3·20	1·70	0·53	0·24	0·104	—	—	—	—
150	—	—	—	—	70·0	10·00	4·70	2·50	0·76	0·34	0·15	—	—	—	—
200	—	—	—	—	104·0	18·70	8·30	4·25	1·33	0·60	0·26	0·16	0·078	—	—
250	—	—	—	—	—	27·50	12·50	6·45	2·05	0·92	0·40	0·20	0·12	—	—
300	—	—	—	—	—	40·00	18·00	9·30	3·00	1·30	0·57	0·29	0·17	0·095	—
350	—	—	—	—	—	—	24·20	12·50	4·00	1·75	0·75	0·38	0·23	0·127	—
400	—	—	—	—	—	—	21·90	16·20	5·20	2·27	0·99	0·50	0·30	0·166	0·07
450	—	—	—	—	—	—	—	20·00	6·50	2·80	1·20	0·62	0·38	0·204	0·086
500	—	—	—	—	—	—	—	25·00	8·00	3·40	1·50	0·76	0·46	0·250	0·110
600	—	—	—	—	—	—	—	34·00	11·20	4·80	2·10	1·07	0·65	[illegible]	[illegible]
700	—	—	—	—	—				15·40	[illegible]	[illegible]	1·44	0·87	[illegible]	[illegible]
800	—	—	—	—	—				19·60	[illegible]	[illegible]	[illegible]	1·10	[illegible]	[illegible]
900	—	—	—	—	—				[illegible]	10·10	[illegible]	2·30	1·40	[illegible]	[illegible]
1,000	—	—	—	—	—				31·00	[illegible]	[illegible]	[illegible]	1·70	[illegible]	[illegible]
1,200	—	—	—	—	—				—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1,400	—	—	—							24·60	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1,600	—	—	—								[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1,800	—	—	—								[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
2,000	—	—	—						—	—	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Supposing the 8-inch pipe is adopted, then the weight of water raised per hour = 40,000 × 10 pounds, so that the theoretical work done per minute = $\frac{40,000 \times 10 \times 72}{60}$ foot pounds, and the *theoretical* or water horse power required to perform this work = $\frac{40,000 \times 10 \times 72}{60 \times 33,000} = 14 \cdot 54$.

But there is inefficiency of the pumping plant due to friction, slippage, etc., and the engine must therefore exert extra power to overcome these inefficiencies, and still provide an excess of power for decreases in efficiency of the engine as it gets older.

Now, since the efficiency of the pump in this case is 70 per cent. (See Table III), it means that for every 7 h.p. used to pump water, 10 h.p. will have to be supplied by the engine. Hence, the *practical* horse power absorbed by the pump is $14 \cdot 54 \times \frac{10}{7} = 20 \cdot 77$.

To provide for the decrease in efficiency of the plant as it gets older, 1 h.p. for every 5 h.p. should be added. Hence, we need an engine of $20 \cdot 77 + \frac{20 \cdot 77}{5} = 24 \cdot 92$ h.p.

The power of an internal combustion engine, however, decreases by approximately 4 per cent. for every 1,000 feet rise above sea level. Hence the engine must provide an additional 16 per cent. of power at an altitude of 4,000 feet. This brings the horse power of the engine up to $24 \cdot 92 + (24 \cdot 92 \times \frac{16}{100}) = 28 \cdot 91$.

Provision must also be made for loss of power due to temperature. The British Standard Specifications specify, in addition to the allowance for altitude, a further loss of 2 per cent. of power for every 10° F. above 62° F. A normal range of 30° F. may be assumed, so that the engine must provide a further 6 per cent. of power. The *actual* horse power necessary is therefore $28 \cdot 91 + (28 \cdot 91 \times \frac{6}{100}) = 30 \cdot 63$.

It should be noted that the end of the suction pipe should never be less than 3 feet below the water surface.

If an electric motor is used, the actual horse power would be the practical h.p. + 25 per cent.

Centrifugal Borehole Pump.

For deep well pumping, the centrifugal borehole pump may be used. This pump is a multi-stage unit driven at high speed by an engine on the surface. The pump should be used only on exceptionally strong boreholes whose capacity is 2,000 gallons per hour upwards.

The pump consists of a tube with a vertical spindle carrying a number of impellers. The intermediate spindle bearings are supported by spider rings about 7 feet apart.

3. The Hydraulic Ram.

The hydraulic ram is a useful self-acting apparatus which utilizes the momentum of a stream of water falling a small height to raise part of the water to a greater height.

Farming in South Africa

The extreme simplicity of the hydraulic ram, and the ease which it can be adjusted to work with varying quantities of water, renders it particularly suitable for supplying water for domestic purposes to farm houses situated near a stream. In the simple arrangement shown in Fig. 6 the water is supplied from a supply cistern through a pipe A called the *drive pipe* into a chamber B called the *body* which has two valves, V called the *waste valve* and V2 called the *delivery valve*. When no flow occurs, the valve V is off its seat, while the valve V2 rests upon its seating. If water is allowed to flow along the drive pipe, it will escape through the valve V, and the energy of the water passing through the open valve causes the valve to close. As the valve commences to close, the velocity of the water passing through increases and the rate of closing accelerates. The rapid closing of this valve arrests the motion of the water in the drive pipe, and there is a sudden rise of pressure in the body chamber, which causes the delivery valve V2 to open, and a portion of the water passes into the air chamber.

The water in the drive pipe and in the body chamber, after being brought to rest, recoils rather violently, and the pressure in the body chamber again diminishes, allowing the waste valve once more to open, and the water again to flow through it.

The cycle of operations is then repeated. More water is forced into the air chamber, in which the air is compressed, and water is forced up the delivery pipe to the desired height.

The Valves.—The valves are controlled by springs or some device which can be regulated so that the number of beats per minute is completely under control, and can be rapidly adjusted to suit varying heads and conditions. The valve may make as many as 200 pulsations per minute, but under normal circumstances the pulsations range from 80 to 120 per minute.

The Snift Valve.—As the water passes through the delivery valve into the air chamber, a little air should be taken with it in order to maintain the quantity of air in the chamber, and a suitable *snift* valve should be provided in the neck of the air chamber just below the delivery valve (Fig. 6), to allow the admission of a snift of air at each pulsation, thus keeping the air chamber properly charged with air.

Drive Pipe and Supply Head or Fall.

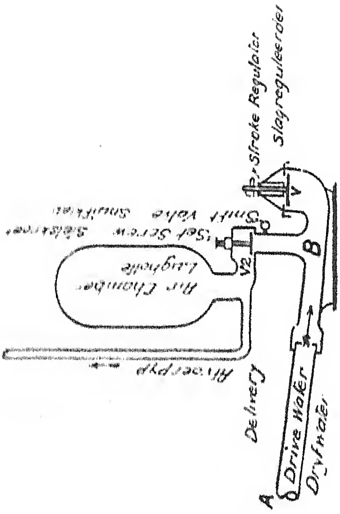
The drive pipe should be laid perfectly straight, and should be at least 25 to 60 feet in length according to the fall and height of delivery. Good results have been obtained with drive pipes having a length up to 10 times the fall, but in general it may be said that the best results are obtained with drive pipes whose lengths are from 4½ to 6 times the working fall. Working falls from 2½ feet up to 80 feet can be used to work a ram, but the more the fall, the less will be the cost of the ram, and the less the driving water required for a given quantity of water to be delivered.

Delivery Pipe and Total Lift.

The connection on the ram for the delivery pipe is determined by the makers and is stated for each size of ram. In considering long delivery pipe lines, friction must be taken into account. The total lift, i.e. the delivery head plus the friction head, may be anything up to 500 feet.

Scanty Supplies.

A ram can be made to work with as little as one gallon of water per minute. The water is allowed to trickle into a cistern, until the level reaches a small pipe leading to a metal container, to which a chain running over a grooved pulley is attached (Fig. 7). The other end of the chain is fastened to a hinged weighted outlet valve in the floor of the cistern which admits water to the drive pipe. When the container is nearly full, it automatically lowers and opens the intake valve. Small holes in the bottom of the container allow the water to flow out slowly, after which the intake valve again closes automatically, and the cistern again fills up to provide a fresh supply to the ram.



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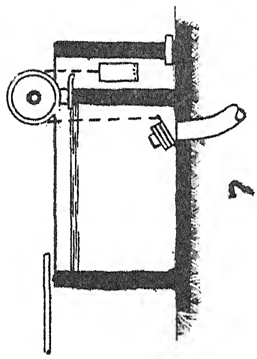

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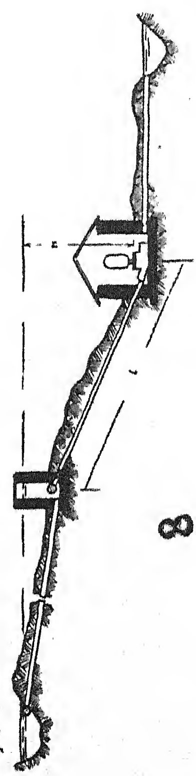

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FIG. 6.—Simple diagram of a ram showing its essentials. Note the position of the snift valve.

FIG. 7.—Cistern with pulley and chain to lift valve where only small amounts of water are available for working a ram.

FIG. 8.—Diagram showing water conducted from a stream to a supply cistern for the ram.

Drive Water and Supply Pipe.

It is desirable to take the drive water in a supply pipe from the stream to a supply cistern out of which the drive pipe leads (Fig. 8). There should be suitable strainers on the end of the supply pipe in the stream, as well as on the intake to the drive pipe in the supply cistern.

Efficiency of Hydraulic Rams.

The efficiency of a ram rapidly decreases with an increase in the height to which the water is to be raised, as will be observed from the following table.

Proportion of lift to fall	4	5	6	7	8	9	10	11	12	13	14	15	16	18	20	25
Efficiency, per cent.	76	74	72	70	67	63	56	49	43	37	32	28	24	19	14	3

Sizes of Rams and Their Approximate Duties Under Various Conditions.

The size of the ram is usually known by the diameter of the drive pipe.

Diameter of the drive pipe	1½"	2"	3"	4"	5"	6"
Adjustable to work with any quantity of driving water in gallons per minute from	2½–6	5–12	13–30	25–50	40–80	60–170
Suitable for forcing to any height in feet up to	500	500	400	400	400	400
Quantity of water raised per 24 hours in gallons	200 to 1,400	350 to 3,000	250 to 7,000	1,500 to 13,000	2,400 to 20,000	2,800 to 28,000
Diameter of delivery pipe	¾"	1"	1¼"	1½"	2"	2½"

Since there are no two sources of supply whose conditions are exactly alike, it is obvious that a ram that will operate well on one supply will not work satisfactorily on another. Hence, to obtain the highest efficiency, the ram should be designed to suit the conditions of the source.

The following data are necessary when placing an order for a ram:—

(1) The minimum quantity of water in cusecs or gallons available per minute.

(2) The vertical fall H in feet (Fig. 8), which can be obtained from the source of supply to the proposed site for the ram.

(3) The distance L in which the fall is obtained, i.e. from the source to the proposed site.

(4) The quantity of water in gallons required to be delivered in 24 hours.

(5) The vertical height or lift in feet to which the water is to be forced above the level of the ram.

(6) The length of the delivery pipe.

Prospective buyers of hydraulic rams are often curious to know what proportion of the drive water is actually raised by a ram.

In a certain case 31,500 gallons of driving water raised 3,400 gallons to a height of 76 feet with a fall of 11 feet.

Hydraulic rams can be used in batteries of two or more, and it is quite often more economical to install two small rams rather than one large one to deliver the same quantity of water. This, of course, applies only to cases where the quantity of water to be raised is comparatively large.

4. Windmills.

The tables below give the output in gallons per hour for different sizes of windmills. The figures assume a back-geared ratio of 3 to 1, and allow for 10 per cent. slip.

If the total lift exceeds 200 feet, windmills are uneconomical and a small powerhead and engine should be used.

Eight-foot wheel with six-inch stroke.

Diameter of cylinder in inches.	Total lift in feet.	Gallons per hour.	
		35 strokes per minute.	50 strokes per minute.
2	110	127	183
2½	75	200	286
3	54	290	415
4	32	510	730
5	21	800	1,145

Ten-foot wheel with six-inch stroke.

Diameter of cylinder in inches.	Total lift in feet.	Gallons per hour.	
		27 strokes per minute.	40 strokes per minute.
2	210	98	147
2½	144	154	230
3	103	224	335
4	61	400	590
5	40	618	920
6	28	892	1,325

Twelve-foot wheel with eight-inch stroke.

Diameter of cylinder in inches.	Total lift in feet.	Gallons per hour.	
		22 strokes per minute.	33 strokes per minute.
2½	236	167	251
3	174	243	364
4	106	426	642
5	70	670	1,010
6	49	970	1,450

In conclusion it should be pointed out that the subject of the delivery of water by means of pumps is a vast one and that the discussions in this article are by no means complete. It is therefore

 [*Continued on page* 620.

Pruning Experiments with Winter Nelis Pears.

A. F. de Wet and W. J. Conradie, Western Province Fruit Research Station, Stellenbosch.

THE following short summary gives particulars of the results obtained so far in pruning experiments with Winter Nelis pears.

According to an orchard survey made in 1926 there were [illegible] pear trees in commercial orchards in the 13 main fruit-producing districts of the western Cape Province. Of the trees, just over 37 per cent. were in the Ceres district, and of these 40·8 per cent. were Bon Chretiens, while Winter Nelis coming next in the order of varieties constituted 10·6 per cent. of the total.

FIG. 1.—Eighteen-year-old Winter Nelis tree on farm A, before pruning. Note vigour and denseness of tree, and masses of spurs on branch in foreground, which is typical of all the trees.

It is not known how many pear trees there are in Ceres now after 21 years, but in an economic study of certain aspects of the deciduous fruit industry made in 1937-38 by Pretorius, Prinsloo and de Waal on 24 farms in the Ceres district, Winter Nelis accounted for 12·5 per cent. of the total number of pear trees and was still maintaining second position.

Winter Nelis is an important commercial variety in other areas as well as in Ceres, and in 1926 it made up over 8 per cent. of the total number of pear trees in the western Cape Province.

Although Winter Nelis is a good quality late variety, many growers complain about its cropping. This dissatisfaction seems to become more general as the trees become full-grown, and in the

Ceres district in particular a generally satisfactory crop of Winter Nelis has practically been an unknown occurrence during the past few years. Consequently, some growers have either taken out their trees or top-worked them to other varieties.

From a pomological point of view two of the factors which might be a cause of these unsatisfactory yields are incorrect pruning and lack of cross-pollination. The past season's experiments were started to test the relative importance of these two factors. The results have not all been fully analysed as yet, since growth records have still to be taken during the winter. Furthermore, with fruit trees, experimental results covering one year cannot be regarded as conclusive. Yet such striking differences were obtained with the different pruning treatments that it is felt that these results should be published as a preliminary report before the next pruning season.

The Experiment.

Experiments were carried out on two farms in the Ceres district. In the case of farm A there were about 400 large 18-year-old Nelis pear trees on good alluvial soil under irrigation. As Fig. 1 shows, the trees were vigorous but rather dense with shoots and branches, as well as masses of spurs. The grower declared that he had pruned

FIG. 2.—Thirty-year-old Winter Nelis tree on farm B, before pruning. Note masses of branches.

harder than usual in 1946, chiefly removing branches, but in the authors' opinion this pruning was not nearly enough, and for the purpose of the experiment the trees were regarded as being lightly pruned. Two random plots of twelve trees each in the same block were alternately given a hard pruning and left unpruned by the authors, while the rest were pruned by the farmer himself. The degree of hard pruning done was what was regarded as necessary for each tree. In actual fact it meant that at least a third of the branches